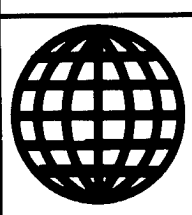
JPRS-ULS-90-021
11 DECEMBER 1990



JPRS Report

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UDC 633.11:631.527.812

Optimization of Haploid Wheat Production With In Vitro Cultivation

907C0834A Moscow DOKLADY VSESOYUZNOY ORDENA LENINA I ORDENA TRUDOVOGO KRASNOGO ZNAMENI AKADEMII SELSKOKHOZYAYSTVENNYKH NAUK IMENI V.I. LENINA in Russian No 5, May 90 (manuscript received 19 Dec 89) pp 6-9

[Article by V. A. Vnuchkova and T. M. Chebotareva, All-Union Scientific Research Institute of Agricultural Bioengineering]

[Abstract] The use of diluted gametocides sprayed on wheat to yield large numbers of macrostructures and haploid regenerants was investigated in 1985-1986 as a means of producing haploid plants in vitro that would later result in their greater use in selection studies. The gametocides TV-VT-6, TV-VT-13, and EF-34 were applied three times to aestival wheat plants Rodina, Saratovskaya 46, and first generation hybrids in 0.2-1.0 percent concentrations. TV-VT-6 proved to be the most effective gametocide, with the treated anthers offering a 1.4 percent yield of macrostructures and 0.4 percent yield of green plants. The results demonstrated that treating wheat plants with a 2 percent concentration of TV-VT-6 led to sterility and death of all the plants, while a 0.5 percent concentration resulted in a 40 percent survival rate. The latter were viable for longer periods of time due to their transition to sporophytic means of development and subsequent formation of macrostructures. Figures 2; references 12: 9 Russian, 3 Western.

UDC 577.217.5

Visual Rhodopsin Synthesis in Cell-Free Translation System. Part II. Functional Properties of Recombinant Rhodopsin and Its Mutant Forms

907C0778A Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 16 No 3, Mar 90 (manuscript received 11 Jul 89) pp 303-308

[V. V. Gurevich, S. A. Zozulya, Ye. P. Shirokova, T. A. Zvyaga, M. N. Garnovskaya*, I. L. Dumler*, P. R. Badalov, M. Yu. Natochin, I. D. Pokrovskaya, and B. Ye. Shmukler, Branch of the Bioorganic Chemistry Institute imeni M. M. Shemyakin, USSR Academy of Sciences, Puschino; *Institute of Evolutionary Physiology and Biochemistry imeni I. M. Sechenov, USSR Academy of Sciences, Leningrad]

[Abstract] The functional properties of recombinant rhodopsin and two of its mutant forms were expressed in vitro and obtained by oligonucleotide-directed mutagenesis. The functional properties of rhodopsin were studied by its ability to activate cGMP phosphodiesterase and transducin GTP-ase. It was demonstrated that opsin that is expressed in a cell-free translation system and is inserted into liposomes from phosphatidylcholine by cotranslation is able to regenerate the 11-cis-retinal chromophor. It was also shown that recombinant rhodopsin does not differ from natural rhodopsin in its spectral and functional properties. Oligonucleotide-directed mutagenesis was used to produce two mutant rhodopsins with amino acid substitutions in the C-terminal domain. The substitution of Cys-316- >Ser does not alter rhodopsin's ability to activate a visual cascade of amplification, while the double mutations Asp-330->Asn and Asp-331- >Asn sharply diminish its functional activity. In vitro translation may be used as a preparative system of expression in protein engineering studies and in other proteins, and also as a system for large scale synthesis of protein for practical use with a continuous supply of energy sources and amino acids into the translation mixture. Figures 2; references 12: 3 Russian, 9 Western.

UDC 547.964.4.057:577.175.852

Synthesis and Study of Cyclic Angiotensin Analogs

907C0778B Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 16 No 3, Mar 90 (manuscript received 26 Jun 89) pp 358-369

[Yu. Ye. Antsans, D. A. Biseniyetse, I. A. Vosekalna, N. V. Myshlyakova, G. I. Chipens, Institute of Organic Synthesis, Latvian SSR Academy of Sciences, Riga]

[Abstract] Five novel cyclic analogs of angiotensin were synthesized and studied using conventional methods of peptide chemistry. Study of the biological activity of the compounds on blood pressure in rats and on smooth muscle in vitro demonstrated that compounds (I) - (IV), which have a fixed potential turn in the C-terminal area of the angiotensin molecule, have no myotropic effect and do not affect the myotropic effect of angiotensins nor arterial pressure in rats. Compound (V) does inhibit the myotropic effect of angiotensin. It also has 0.1 percent of the pressor activity of angiotensin in a concentration of 10^{-6} M/kg, while larger doses of (V) were shown to diminish the pressor effect of angiotensin by 17-41 percent, most likely due to competitive antagonism. Circular dichroism spectra in water and ethanol were used to study the chiroptical properties of the compounds. Figures 11; references 14: 5 Russian, 9 Western.

UDC 612.8.52

Some Information Transformations in Neural Networks With Dynamic Synaptic Elements

907C0341 Yerevan BIOLOGICHESKIY ZHURNAL ARMENII in Russian Vol 42 No 4, Apr 89 pp 393-400

[Article by D. S. Melkonyan and S. G. Sarkisyan, Physiology Institute imeni L. A. Orbeli of the Armenian SSR Academy of Sciences, Laboratory of Mathematical Modeling of Neural Systems]

[Text] *A number of dependencies concerning input-output relationships demonstrating the fundamental possibility that neurons with two functionally different inputs can function as detectors and as converters of afferent pulse trains are obtained from an investigation of certain information transformations occurring in neural networks with dynamic synaptic elements.*

Data from modern neurobiology indicate that chemical synaptic transmission plays a primary role in the processing of information by the nervous system. Until recently, these data were virtually unused in research involving neural networks. For example, consideration of synaptic elements in the theory of formal neurons[1,2] amounted to integration of the quantity of stimulatory and inhibitory synaptic inputs and generation, following a certain delay, of an output pulse if the total number exceeded the neuron's activation threshold.

Simulation of neural networks in computer experiments made it possible to arrive at a more-detailed description of the dynamic characteristics of synaptic elements, although, primarily, only processes associated with expenditure and replenishment of the transmitter were considered.

Attempts to account for the particular features in interaction of expenditure-replenishment and mobilization-demobilization processes underlying the synaptic phenomena of potentiation and depression have generally led to cumbersome models: the Lara-Tapia model, for example, contains three subsystems and 15 parameters.[7]

Dynamic Synaptic Modulator (DYSYM)

A previously published work[3] described the basic laws governing transsynaptic conduction with a nonlinear dynamic model containing five parameters having clear physical meaning. The model is based on the notion of three fractions—mobilization M, operational R, and intermediate S—the rules of transmitter transport between which are formulated as quantum and macrophysical postulates.

Presynaptic nerve pulses are treated in the model as a sequence of δ-functions, namely,

$$x(t) = \sum_{k=1}^{N} \delta(t - t_k), \quad (1)$$

where t_k represents the moments of arrival of the pulses and N is the number of pulses in a train. In response to these pulses, portions of the transmitter shift practically instantaneously from the mobilization fraction to the operational fraction, and from the operational to the intermediate fraction. In the intervals between pulses, there occurs a relatively slow process of return transport of the transmitter (replenishment and demobilization).

The model presumes constancy of the total volume of transmitter—that is,

$$M + R + S = V_0 = \text{const}.$$

The rate of change of the transmitter in the intermediate fraction is

$$dS/dt = -S/\tau_R + \nu_R R x, \quad (2)$$

where x is the input, δ is the function, ν_R is the coefficient of transport of the transmitter from the operational fraction to the intermediate fraction, and τ_R is the time constant of transmitter replenishment in the operational fraction.

Similarly, the rate of change of the transmitter volume in the mobilization fraction is

$$dM/dt = (1/\tau_M)(M_0 - M) - \nu_M M x, \quad (3)$$

where ν_M is the coefficient of transport of transmitter from the mobilization fraction to the operational fraction, τ_M is the time constant of demobilization—i.e., transition of the transmitter from the operational to the mobilization fraction, and M_0 is the initial volume of the transmitter in the fraction, determined from the expression:

$$M_0 = \varepsilon V_0,$$

where ε is a dimensionless coefficient

$$(\varepsilon \in [0; 1]).$$

In response to (1), functions M, R and S experience first-order discontinuities at points

$$t_k (K = \overline{1, N})$$

The values of the functions to the left and right of the point of discontinuity are denoted as

$$M(t_k^-),\ R(t_k^-),\ S(t_k^-) \quad \text{and} \quad M(t_k^+),\ R(t_k^+),\ S(t_k^+).$$

With such notation, the solutions to differential equations (2) and (3) are

$$S(t) = \sum_{k=1}^{N} \nu_R R(t_k^-) \exp(-(t-t_k)/\tau_R) \cdot 1(t-t_k),$$

$$M(t) = M_0 - \sum_{k=1}^{N} \nu_M M(t_k^-) \exp(-(t-t_k)/\tau_M) \cdot 1(t-t_k),$$

where is a single function.

$$1(t) = \int_{-\infty}^{+\infty} \delta(t)\, dt$$

Given the initial conditions

$$M(t_1^-) = M_0;\ S(t_1^-) = 0$$

$$S(t_{k+1}^-) = S(t_k^+) \exp(-(t_{k+1}-t_k)/\tau_R) \quad (4)$$

$$M(t_{k+1}^-) = M_0 - (M_0 - M(t_k^+)) \exp(-(t_{k+1}-t_k)/\tau_M). \quad (5)$$

Corresponding to the mathematical description of synaptic transmission presented above is a transmitter transport control system which may be interpreted as an independent functional element of neural systems—the DYSYM, which forms an output pulse function out of the input δ-function:

$$y(t) = \sum_{k=1}^{N} r_k \delta(t-t_k), \quad (6)$$

where r_k is the portion of the transmitter released from the synaptic ending in response to the k-th presynaptic pulse, where $r_k = \nu_R R(t_k)$.

Each portion of the released transmitter that forms the output function y cannot be directly measured experimentally. However, its transfer into the extracellular space is registered as a change in membrane potential of the postsynaptic neuron. Given conditions ensuring linear and stationary behavior of the postsynaptic membrane, the total postsynaptic potential (PSP) is equal to:

$$z(t) = \bar{r}_k \sum_{k=1}^{N} U(t-t_k) \cdot 1(t-t_k), \quad (7)$$

where z(t) is the total PSP,

$$\bar{r}_k = r_k / r_1$$

is the relative volume of the released transmitter, and U is the pulse transfer function of the postsynaptic membrane for which the following form is used in calculations[6]:

$$U(t) = \frac{A}{C(1/\tau - K)^2}(((1/\tau - K)t - 1)\exp(-Kt) + \exp(-t/\tau)). \quad (8)$$

where $\tau = R \times C$ is the equivalent of the membrane's time constant (R is the total resistance, C is the capacitance), A is membrane current strength, and K is the equivalent of the growth rate of this current.

In order to analyze spike activity we need to determine the moments of generation of action potentials. For these purposes we use a differential equation determining the threshold of neuron excitation at any moment in time,

$$dQ/dt = -(1/\mu)(Q-Q_0),$$

whose solution is the expression

$$Q(t) = Q_0 + \Delta Q \exp t\text{-}/(\mu), \quad (9)$$

where Q_0 is the initial threshold, ΔQ is the relative increase in the threshold at the moments of spike generation, and μ is the time constant equivalent.[8]

A Neural Network With Two Inputs

Obtained with the DYSYM model, the frequency dependencies for the principal sets of conditions[3] agree satisfactorily with experimental findings. That is why synaptic modulators were introduced as components into the neural network examined below.

Figure 1(A) is a diagram of a neural network consisting of three neurons, the behavior of which we studied in our work. Neurons 1 and 2, respectively, form the axosomatic and axodendritic inputs of the central neuron C. This structure is typical, for example, of rubrospinal neurons[9] and neurons of the antero-anteroventral part of the cochlear nuclei.[4]

Because of structural and functional differences, the indicated inputs also differ in their PSP characteristics. For example, in view of the fact that the central neuron (referred from now on simply as the neuron) involves nerve cells with a single low-threshold area situated on the axon hillock, the dendritic PSP propagates to the soma electrotonically, as a result of which the dendritic PSP has more-gently sloping leading and trailing edges of membrane potential variation than does the somatic PSP.

As a result, the membrane current growth rates K were identified for both inputs: 850 $msec^{-1}$ for the somatic input and 82 $msec^{-1}$ for the dendritic input at the same

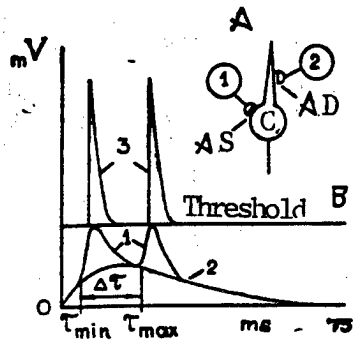

Figure 1. A. Structural diagram of a neural network. C—central neuron; 1 and 2—afferent nerve cells forming axosomatic (AS) and axodendritic (AD) synapses, respectively, on the central neuron. B. Spike generation by the central neuron. 1—axosomatic PSP, 2—axodendritic PSP, 3—generated spikes; $_{min}$ and $_{max}$ are, respectively, the minimum and maximum shifts in response to which spike generation occurs; is the possible interval in which an action potential is evoked.

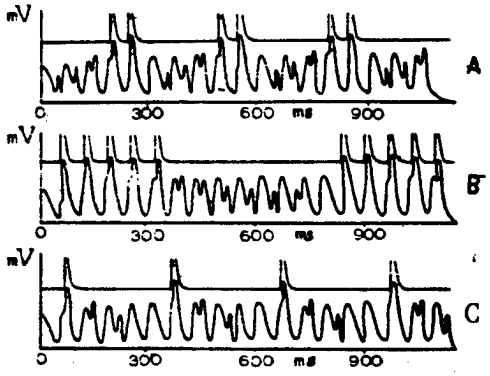

Figure 2. Illustration of a neuron's capacity for acting as a frequency divider, and the dependencies of the number of generated spikes on the mismatch interval ($_m$) between axodendritic ($_{ad}$) and axosomatic ($_{as}$ stimuli: A. $_{ad}$ = 60 msec, $_{as}$ = 50 msec, $_m$ = 10 msec; B. $_{ad}$ = 60 msec, $_{as}$ = 65 msec, $_m$ = 5 msec; C. $_{ad}$ = 60 msec, $_{as}$ = 75 msec, $_m$ = 15 msec. (In all cases interval = 26 msec).

membrane time constant of 0.0024 sec. At these values of K, the PSP attains its maximums at the 3rd and 15th milliseconds, respectively.

The parameters of synaptic elements within the DYSYM model were also obtained: for the axosomatic input, τ_R = 89 msec, τ_M = 9 msec, ν_R = 0.03, V_M = 0.11, ε = 0.9; for the axodendritic input, τ_R = 70 msec, τ_M = 100 msec, V_R = 0.08, V_M = 0.043, ε = 0.9.

Owing to significant differences in the characteristics of the PSPs of the somatic and dendritic inputs, computer experiments[5] showed that when a certain combination of pulses reaches the two inputs, the neuron may perform the function of a coincidence detector. In this case the possible interval in which an action potential may be evoked for one pair of presynaptic pulses, $\Delta\tau$, is determined by way of the minimum τ_{min} and maximum τ_{max} shifts between the starting points of input stimulation, at which spike generation still occurs—i.e., $\Delta\tau = \tau_{max}$-τ_{min} (Figure 1 [B]).

In the case of rhythmical stimulation of both inputs, the effect of potentiation at the axodendritic synapse on later pulses widens considerably the possible interval of spike generation $\Delta\tau$. This may occur both as a result of an increase in τ_{max} and a decrease in τ_{min}.

These processes also have a great influence on the neuron's output activity. For example, given equality of stimulating frequencies, there is an optimum shift between the starting points of excitation of the axodendritic and axosomatic imputs, and the number of generated spikes is equal to the number of pulses in each of the presynaptic inputs. Given such a shift, all information corresponding to the integrated synaptic signal is transmitted to the next nerve cell in its entirety.

In the case of other shifts, an information loss occurs initially, since spike generation begins with the advent of later pairs of pulses. And in the case of shifts that are outside the interval $\Delta\tau$, the neuron does not respond, and only subthreshold change in membrane potential occurs.

Thus, the overall mechanism of signal detection remains intact even in the context of potentiation processes.

When both inputs are stimulated by pulse trains arriving at a different frequency, the neural network described here may be seen to act as a frequency divider. In this case, if the interval Δ_m of the mismatch between stimuli at the inputs is greater than $\Delta\tau$, lone pulses are generated at the output; when $\Delta_m \leq \Delta\tau$, groups of pulses are generated (Figure 2 [A, B]). In the case where $\Delta\tau < \Delta_m \leq \Delta\tau$, we may have both a lone pulse (Figure 2 [C]) and groups, with two pulses in each group.

Note that the greater the mismatch frequency, the larger the number of pulses in a group; however, spike generation will not occur when afferent frequencies coincide. This happens because of the absence of a shift in the process of integration of the input signals, which results with time in a delay between certain pairs of presynaptic pulses that enables the integrated membrane potential to exceed the neuron's excitation threshold.

The latent period T_L, which defines the interval from the moment the perturbation at the afferent inputs of the neuron begins to act to the moment the first action potential appears, is closely associated with the level of spike activity. Simultaneous consideration of excitation of both the axosomatic and axodendritic inputs shows that the length of the latent period varies strongly in response to the shift τ between the starting points of stimulation of presynaptic endings.

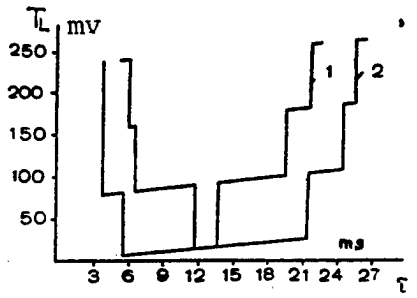

Figure 3. Dependence of latent period on the shift between the starting points of stimulation of presynaptic inputs: T_L—latent period, —shift between the starting points of stimulation; 1—the PSP ratio of the axodendritic input to the axosomatic input is equal to 1.1; 2—the same ratio, equal to 1.3. (The amplitude of the axosomatic input is constant).

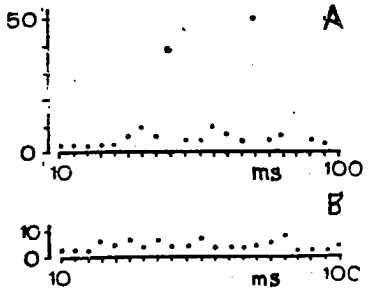

Figure 4. Relationship between the sequence number of the pulse in an axosomatic train that causes the neuron to generate the first spike and the stimulation interval: A. Excitation of inputs begins simultaneously; B. Stimulation of the axosomatic imput begins with a delay of 6 msec.

Figure 3 illustrates the dependence of T_L on τ for two different axodendritic input/axosomatic input PSP ratios when the frequency of stimulation is the same for both inputs. Abrupt changes in the length of the latent period correspond to the change in sequence numbers of afferent pulses responsible for generation of the first spike, while the straight sections indicate changes in the latent period in response to shifts within the interval in which an action potential may possibly be evoked. It should be noted, however, that the dependence of T_L on τ is nonlinear in the latter case owing to nonlinearity of the characteristic of the PSP of the synaptic inputs. As a result, when the intensity of stimulation of presynaptic endings differs, an identical latent period does not exist in the presence of the same shift between the starting points of the stimuli of the two inputs. Consequently, T_L could be used not only to identify the fact itself of the presence of a delay (a shift) in application of the stimulus to the axosomatic input relative to the axodendritic input, but also to determine its magnitude.

This phenomenon makes it possible for a neuron with two functionally different inputs to perform, in addition to the functions of a coincidence detector, the function of a phase detector—that is, to react uniquely to the shift between the starting points of rhythmical perturbations of afferents.

The complex nature of change in length of the latent period, and consequently of the level of spike activity associated with it, is also observed with change in frequency of presynaptic stimulation of one input while maintaining a constant inter-pulse interval at the other. The reason for this lies basically in the change in the number of the pulse in a train of variable afferent stimulation, in response to which integration of a certain pair of presynaptic pulses is sufficient to generate a spike.

In the computer experiment, the frequency of nerve pulses was allowed to vary at the axosomatic synapse from 10 to 100 pulses per second on a logarithmic scale, while the interval of stimulation of the axodendritic synapse was kept constant and equal to 75 msec (Figure 4). Substantial changes in the sequence number of a pulse in an axosomatic train, which is responsible for generation of an action potential, are observed in the case of simultaneous excitation of both inputs. These changes occur when the axosomatic frequency of stimulation is approximately a multiple of the axodendritic frequency. However, given strict satisfaction of the conditions

$$\Delta_{as} = (1/K)\Delta_{ad} \text{ and } \Delta_{as} > \Delta\tau,$$

where Δ_{as} and Δ_{ad} are, respectively, the intervals of stimulation of the axosomatic and axodendritic inputs, and K = 1,2,..., the neuron will be in a subthreshold mode.

Given the parameters indicated above, the following axosomatic input stimulation intervals are just such "critical" intervals: 25 msec, 50 msec, 75 msec, and so on at 25 msec intervals. Nonetheless, the fact that prolonged silence or activation occurs in response to a certain pulse with a large sequence number permits the hypothesis that afferent signal packets come in multiples.

If stimulation of the axosomatic input begins with a certain delay (Figure 4 [B]), changes in the sequence number of the pulse eliciting the spike are less significant, in view of the fact that at "critical" frequencies the existing shift (6 msec in this case) is sufficient for attainment of an integrated membrane potential of threshold level. At other frequencies pulses of the same train move in unique fashion relative to the other (see also Figure 2), and therefore the neuron would be activated at any frequency within the given range.

Note that the possibilities found in a neuron with two inputs for reacting in a certain fashion to incoming information and detecting afferent signal packets differ fundamentally from what was previously described[4]: in the latter case the entire responsibility for such behavior was ascribed to some dendritic structure, and important processes involved in the dynamics of synaptic transmission were not examined.

Thus, computer experiments carried out with neural networks possessing dynamic synaptic elements made it possible to identify a capacity in neurons with two functionally different inputs for accomplishing certain information transformations—in particular, for carrying out certain functions as detectors and logical converters of trains of afferent pulses.

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UDC 578.085

Electrofusion of Selected Pairs of Tobacco Protoplasts

907C0743A Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B—GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 6, Jun 90 (manuscript received 5 Mar 90) pp 74-77

[Article by I. V. Kirichenko, Department of Cell Biology and Engineering, Institute of Botany, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Novel techniques of electrofusion were used for selected pairs of Nicotiana tabacum and N. plumbaginifolia protoplasts, yielding a fusion success rate of approximately 90 percent in N. tabacum + N. tabacum and N. tabacum + N. plumbaginifolia combinations. The rate of plant regeneration from the resultant microcolonies was approximately 4-18 percent. Electrofusion was accomplished with 50 μm diameter platinum microelectrodes with an interelectrodal space of 200-400 μm, and right angle 14-20 V impulses delivered from an ESL-2 stimulator fed by a L-31 generator to create a 5-10 V dielectrophoresis potential. Figures 5; tables 1; references 14: 1 Russian, 13 Western.

UDC 614.73+614.31:546.79(470.311-25)

Radioactivity of the Atmosphere and in Food Products in Moscow in 1984-1985

907C0213 Moscow GIGIYENA I SANITARIYA in Russian No 7, Jul 89 (manuscript received 12 Apr 85) pp 66-68

[Article by A. S. Zykova, Ye. L. Telushkina and T. F. Voronina, Biophysics Institute, USSR Ministry of Health]

[Text] In 1984-1985, in Moscow and its suburbs, observations continued of artificial radionuclide levels in the atmosphere and in certain food products of plant and animal origin that were produced in Moscow Oblast. Radioactive precipitation was collected by the sedimentation method at five points in Moscow and the suburbs within a 30-kilometer radius.

Flasks used to collect the precipitation were set out for 10 days, after which they were sent to a laboratory where radiochemical and gamma spectrometric methods were used to determine the total content of beta and gamma radioactive substances and to identify the individual radionuclides in the precipitate.

Figure 1 shows the monthly density of beta and gamma radionuclide fallout in Moscow and suburbs. It is obvious that during 1984-1985 the density of radioactive fallout was roughly the same. In analyzing the curves describing the fallout of radionuclides in Moscow and its suburbs, one should note how closely they match. This is evidence that radioactive fallout in Moscow is somewhat higher than in the suburbs. Only from April to October 1984 was the density of radioactive substances somewhat higher in the suburbs than in Moscow.

Seasonal variations in radioactive fallout were also observed. The highest densities were noted in May, June and September 1984 and in June, July and September 1985. This is explained by the active exchange of air masses between the stratosphere and the troposphere and the increased precipitation. The highest average monthly density of radionuclide fallout in Moscow during the observation period was in May 1984 and September 1985. It was 34 and 30 Bq/m^2, respectively. A comparison of these figures with the highest average monthly fallout density of radioactive aerosols in 1983 showed that they were 1.5 to 1.7 times lower.

The annual density of fallout of radioactive substances in Moscow during 1984 and 1985 was almost identical: 243 and 237 Bq/m^2, respectively. A comparison of these

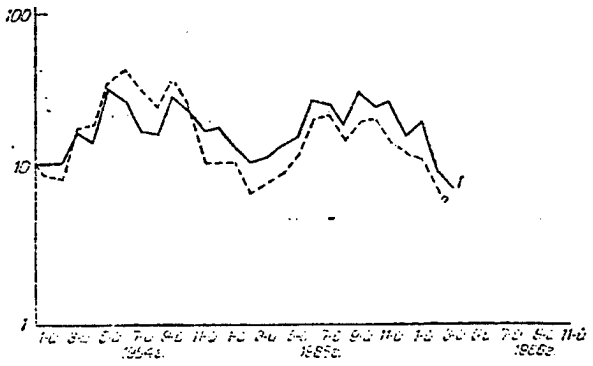

Figure 1. Fallout of Radioactive Aerosols during 1984-1985. (Key to figures 1 and 2): Horizontal axis—period of study; vertical axis—density of fallout (Bq/m^2). 1—Moscow 2—Suburbs

data with results obtained in 1983 shows that during 1984-1985 the density of radioactive fallout experienced practically no change.

The fallout of long-lived ^{90}Sr in 1984 and 1985 was 1.6- and 2.3-fold lower than in 1983, averaging 2.65 and 1.85 Bq/m^2, respectively, for Moscow and its suburbs.

The fallout of ^{137}Cs in Moscow and the suburbs in 1984 and 1985 averaged 2.65 and 2.3 Bq/m^2, which were 1.3 and 1.5 times lower than in 1983. The ratio of ^{137}Cs to ^{90}Sr in the fallout during these two years varied between 0.7 and 2.2, averaging 1.2.

In addition to observations of the radiation levels in the precipitation, there was continual monitoring of the concentration of radioactive aerosols in the atmosphere in Moscow during 1984-1985. With an aspiration device filtering 1,000 m^3 of air per hour, radioactive aerosols were trapped on a 0.35 m^2 filter made of FPP [not further expanded] tissue. The samplings were made for seven hours daily for five days. Radiochemical and gamma spectrometric methods were used to identify radioactive aerosols trapped in the filter. Figure 2 shows the dynamics of the average monthly concentrations of beta and gamma radioactive aerosols in the atmosphere over Moscow and the suburbs.

In analyzing the curves describing the level of atmospheric radioactivity in various periods of the year, it should be noted that a relatively high concentration of radioactive aerosols was observed during February and March of 1984. From April through October 1984 the amount of radioactive substances in the atmosphere declined. In November 1984 there was somewhat of an increase in the concentration of radioactive aerosols; this level remained until March 1985. From April through September 1985, the amount of radionuclides in the atmosphere gradually declined. From October 1985 until the end of the year it increased.

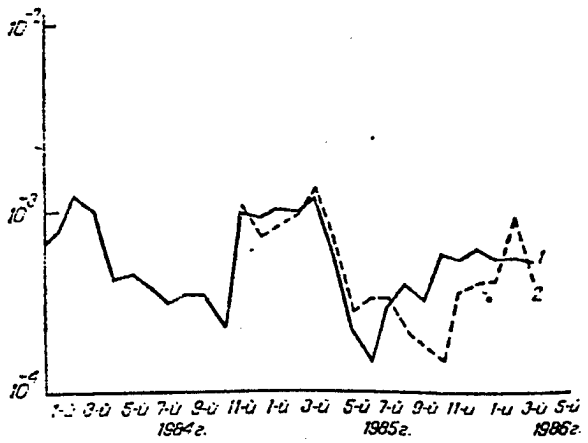

Figure 2. Content of radioactive aerosols in atmosphere during 1984-1985. Vertical axis represent concentration of radioactive aerosols in Bq/m^3

The average annual concentration of beta-active substances and certain radionuclides in the atmosphere during 1984 and 1985 differed little from that in 1983.

During 1984-1985, monitoring continued of ^{90}Sr and ^{137}Cs in certain food products produced in three rayons of Moscow Oblast. Quarterly samples were taken of milk, while potatoes and produce were tested twice a year, in the third and fourth quarters.

Table 1 presents the results of those surveys, averaged over a calendar year for the three rayons in Moscow Oblast.

Table 1. Content of ^{90}Sr and ^{137}Cs (in Bq/l, Bq/kg) in food products in 1983-1985 (M+/-m)

	^{137}Cs			^{90}Sr			$^{137}Cs/^{90}Sr$		
Product	**1983**	**1984**	**1985**	**1983**	**1984**	**1985**	**1983**	**1984**	**1985**
Milk	0.1+/-0.04	0.09+/-0.03	0.06+/-0.03	0.04+/ -0.008	0.04+/-0.02	0.+/-0.	2.5	2.3	1.5
	12	11	12	12	12	12			
Potatoes	0.09+/-0.04	0.07+/-0.03	0.1+/-0.5	0.09+/-0.02	0.09+/-0.03	0.09+/-0.03	1.0	0.8	1.1
	6	6	6	6	6	6			
Cabbage	0.1+/-0.08	0.1+/-0.045	0.12+/-0.11	0.06+/-0.01	0.08+/-0.05	0.1+/-0.09	1.7	1.25	1.2
	6	6	6	6	6	6			
Carrots	0.2+/-0.14	0.1+/-0.5	0.2+/-0.11	0.27+/-0.22	0.1+/-0.04	0.21+/-0.13	0.7	1.0	0.9
	6	6	6	6	6	6			
Beets	0.22+/-0.12	0.13+/-0.05	0.18+/-0.09	0.21+/-0.12	0.14+/-0.08	0.26+/-0.08	1.0	0.9	0.7
	6	6	6	6	6	6			

Note:The number in the parentheses represents the number of samples taken.

The average content of ^{90}Sr in most of the food products analyzed (with the exception of root crops) was almost the same in 1984 as it was in 1985. The content of ^{90}Sr in most samples did not change at all compared to 1983. The average concentration of ^{137}Cs in agricultural products from the 1984 and 1985 harvests differed negligibly, remaining about the same as in 1983. The $^{137}Cs/^{90}Sr$ ratio in most of the analyzed samples varied between 1 and 2.3, i.e., the concentration of ^{137}Cs was either equal to or greater than that of ^{90}Sr. Only in beet samples was this ratio less than unity: 0.7 to 0.9.

Using the actual data on ^{90}Sr and ^{137}Cs in milk, potatoes, fruit and vegetables produced in Moscow Oblast, as well as the national averages for contamination of basic foodstuffs (meat, grain and fish) and data on per capita consumption of these products,[1,3] we estimated the intake of the radionuclides by the inhabitants of Moscow and the doses produced from the nuclides. Our calculations assumed that the Moscow population consumed milk, produce and potatoes produced mainly in Moscow Oblast. The amounts of ^{90}Sr and ^{137}Cs in food products are shown in Table 2.

Table 2. Bodily intake of ^{90}Sr and ^{137}Cs with basic food products (in Bq/year) among resident of Moscow in 1983-1985

	^{90}Sr			^{137}Cs		
Products	**1983**	**1984**	**1985**	**1983**	**1984**	**1985**
Bread products	19.5	26.8	26.3	26.6	35.1	39.2
Milk	5.8	5.8	5.8	14.4	13.1	8.7
Potatoes	8.6	8.6	8.6	8.6	6.7	9.6
Vegetables	13.1	7.8	13.8	15.0	8.0	12.2
Meat	9.5	8.1	8.2	34.2	20.5	21.5
Marine fish	5.5	6.1	4.05	10.3	11.2	6.6
Totals	62.0	63.2	66.8	109.1	94.6	97.8

As can be seen from Table 2, during 1983-1985 there was little change in the intake of radionuclides from foodstuffs.

Based upon the data obtained, we calculated the average individual equivalent doses of irradiation of red bone marrow and the endosteal cells from ^{90}Sr and of soft tissue (the entire body) from ^{137}Cs

In calculating the equivalent doses received by the population we used data on critical organs and tissues and on the metabolism of radionuclides in the human body given in "Maximum Intake of Radionuclides for Those Working With Ionizing Radiation"[4] and "The Recommendations of the I.C.R.P."[5] The estimates of the doses received by the population are given in Table 3.

Table 3. Average equivalent doses of internal irradiation (in Sv/year) for the Moscow population from ^{90}Sr and ^{137}Cs entering the Body with basic foodstuffs

	^{90}Sr		^{137}Cs
Year	**Red Bone Marrow**	**Bone Surface**	**Soft Tissue (Entire Body)**
1983	11.7(1.17)	26.0(2.6)	1.44(0.14)
1984	12.0(1.20)	26.5(2.65)	1.23(0.12)
1985	12.7(1.27)	28.1(2.81)	1.65(0.16)

Note: Numbers in parentheses are millirems per year)

The analysis of the data obtained shows that the level of internal irradiation from radionuclides during 1984-1985 was about the same as in 1983.

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UDC 616.98:578.828.6]-22.363-078

Penetration and Spread of Human Immunodeficiency Virus in Homosexual Population of Moscow

907C0831A Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOLOGII in Russian No 5, May 90 pp 18-22

[Article by V. I. Pokrovskiy and I. Yu. Yeramova, USSR Ministry of Health Central Scientific-Research Institute of Epidemiology, Moscow]

[Text] Traditionally, male homosexuals and bisexuals have been considered to be one of the most vulnerable groups to HIV infection [4]. The latter have increased the threat of spreading HIV infections via the heterosexual route. In 1987 we described a case of an HIV infection brought into the USSR by a homosexual who became infected in Africa in 1982 through sexual contacts with local inhabitants [1]. That person infected five bisexuals who in turn infected four women partners and five blood recipients. However, investigations undertaken in 1986-1987 demonstrated a comparatively low level of infection among homosexuals in the USSR [2, 3], but it was not clear as to whether this small number was due to the absence of the virus in this subpopulation.

The task of this study was to identify HIV-infected persons by means of conducting an epidemiological investigation of each detected case of infection in planned and anonymous examinations for the purpose of establishing the precise extent of HIV incidence and the characteristics of its circulation among the population of Moscow homosexuals.

Materials and Methods.

In view of the criminal accountability that presently exists in the USSR and a number of other countries for homosexual behavior and the general negative attitude of the public toward homosexuals, an investigation of this group entails considerable difficulty which is further exacerbated by the fact that the overwhelming majority of homosexuals carefully conceal their sexual orientation. In that connection, in order to identify contacts we employed a method which with the approval of the WHO has come to be called "partner notification." Persons identified in the course of planned or anonymous examinations as HIV carriers and their sexual partners were asked to fill out a specially designed questionnaire in order to establish their risk factors, and particularly, their sexual case history.

In all cases information from patients found to be HIV-infected was obtained under conditions of strict confidentiality or anonymity. The infected person was given the right either to inform his partners himself or to give the epidemiologist some minimal information about them (usually a telephone number and first name).

The blood serum of contact persons was tested employing the test systems manufactured by the Organon Teknica and Genetic Systems firms. Positive readings were confirmed by immune blot employing the test system of the Du Pont company.

Results and Discussion.

After each infected case was identified we established the individual epidemic chains of events that enabled us to examine a large group of persons, i.e., representatives of the homosexual and bisexual population and their characteristic behavior that affected HIV incidence.

In the summer of 1987 an anonymous examination identified a HIV-infected patient No. 1 (Fig. 1) who was a chief physician of a medical institution and an admitted bisexual. He suggested the probable source of infection with whom he had numerous genital-anal relations and whose behavior he believed was hazardous with respect to infection. That person turned out to be an HIV-infected bisexual (No. 2) who had been in engaging in sexual relations for money since 1983 until the present time with homosexuals from the USA, Latin America, and Western European countries, and primarily with businessmen and diplomats arriving in the USSR for short-term visits. Sexual contacts with them were of temporary nature. Inasmuch as patient No. 2 denied having any blood transfusions or intravenous drug usage, the probable route of infection was sexual from an unknown foreigner.

Patient No. 2 indicated that from the beginning of 1985 to June 1988, in addition to foreigners, he had sexual contact with 14 fellow citizens (13 male homo- and bisexuals, and one woman). We succeeded in examining seven persons (six males and one woman) and discovered that one of them (No. 4) also exhibited HIV antibodies. Upon obtaining additional medical history we found that patients Nos. 2 and 4 as well as No. 3, who was identified as HIV-infected in an earlier routine systematic examination, participated in group sex in the summer of 1987. Consequently, No. 2 could also have been a source of infection for patients Nos. 3 and 4.

Patient No. 3 is a bisexual. Prior to his encounter with patients Nos. 2 and 4, for the most part he had occasional sexual relationships with approximately seven women and 11 men, one of whom was a tourist from Finland (relationship was in 1981 at which time no HIV-infections had as yet been noted in Finland). It is more probable that patient No. 3 became infected as a result of sexual contacts with "fellow citizen" HIV-infected bisexuals Nos. 2 and 4 who had engaged in sexual contacts with homosexuals from countries with a high level of HIV infections. This confirms the negative readings from tests of his four partners up to 1987.

Patient No. 4 (also a bisexual) indicated that he had four homosexual relationships with foreigners from Austria, the USA, Bangladesh, and Columbia. Of the 10 fellow-citizen partners he named (5 women and five men), six

Permeation of HIV Among the Moscow Homosexual Population in Sexual Contacts with Foreigners

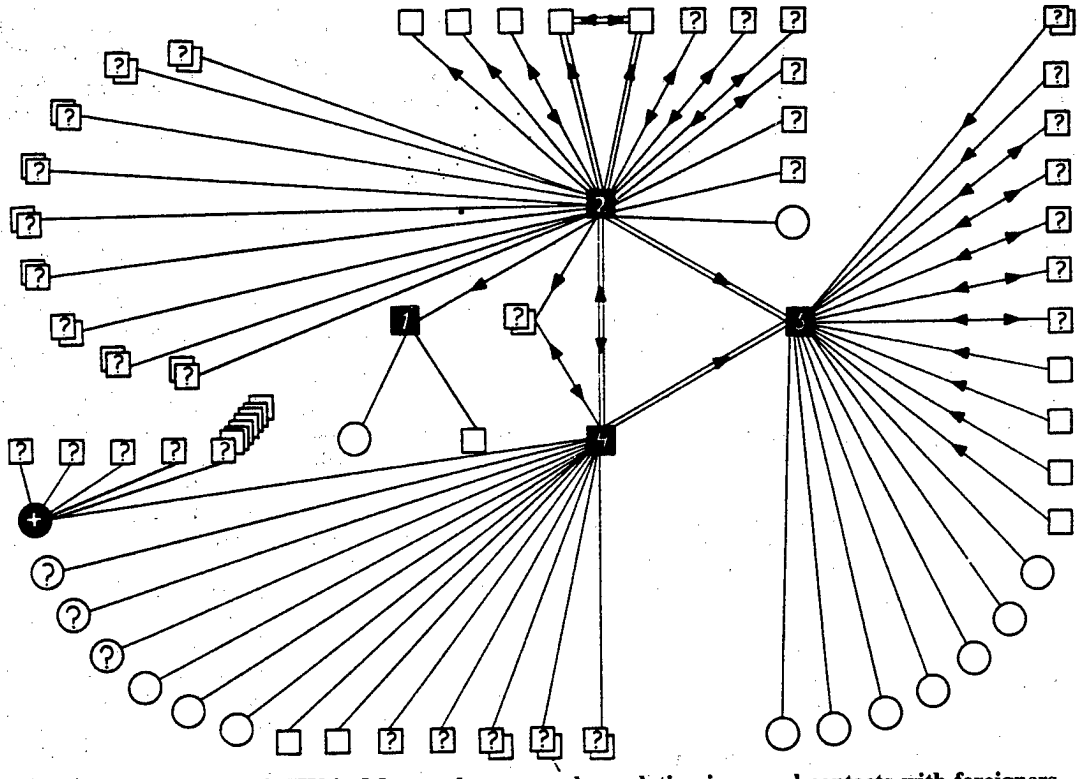

Figure 1. Permeation of HIV in Moscow homosexual population in sexual contacts with foreigners.

Here and in Figure 2: black squares denote serum positive male, white squares denote serum-negative (figures in the squares are the numbers of the patients), white squares with question marks denote unexamined male, double white square with question mark denotes unexamined foreigner; black circle with cross denotes female deceased from AIDS; white circles denote serum-negative women; white circle with question mark denotes unexamined women; white square with cross denotes deceased unexamined male; small white circles denote serum-negative child; continuous lines denote sexual relationship; double continuous lines denote group sexual relationship; triple continuous lines denote narcotic relationship; arrows denote sexual role of partners (active, passive, mixed).

(two women and 4 men) were tested with negative readings. However, the sexual female partner of patient No. 4 turned out to be a woman who died of AIDS in 1988 in Leningrad. This first case of an AIDS fatality in the USSR was given broad coverage in the press, but a local epidemiological investigation did not yield any positive results.

Thus, the HIV-infected patients Nos. 2, 3, and 4 were young (under the age of 30) residents of Moscow who were leading active sexual lives. Similarly active persons who have had numerous sexual contacts with foreigners and easily engage in homo- and bisexual relationships with fellow citizens, as our investigation shows, must doubtless be an intermediate link in the spread of HIV-infection from western countries to the USSR. Hence one can assume that by 1988 HIV had already penetrated the population of Moscow homosexuals.

This assumption has been confirmed by our latest observations. In 1988 we detected two young persons with antibodies to HIV who had been on a registry with respect to venereal diseases: patients Nos. 5 and 1 (Fig. 2), and who, as it turned out, were associated epidemiologically although they did not personally know each other.

Patient No. 5 is a homosexual who became afflicted with syphilis in 1986, and who consequently was undergoing periodic tests for HIV infection at a venereal disease clinic near his residence. The last test to yield a negative reading was in February 1988. The first test indicating the presence of HIV antibodies was in September 1988. A serological examination of his partners up to 1987 yielded negative readings. Consequently, patient No. 5 could have become infected sometime between the end of 1987 and September 1988. A serological examination of his partners up to 1988 that detected one partner with HIV antibodies (No. 6) and a comparison of the time of sexual contact with him (March 1988) allow us to conclude that No. 6 was indeed the source of HIV infection in patient No. 5. In that regard it is instructive

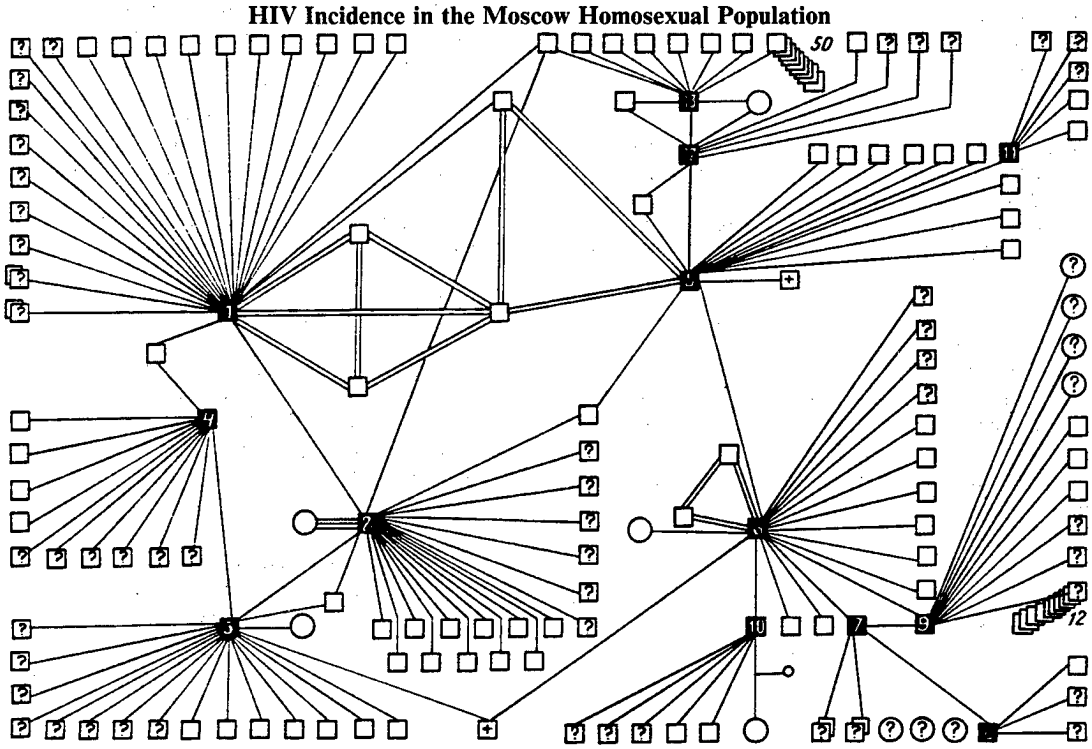

Figure 2. HIV incidence in the population of Moscow homosexuals

that patient No. 5 became infected as a result of merely two anal-genital relationships with No. 6. One of the sexual partners of patient No. 5 died in March 1988 without having been tested, but his clinical history did not exclude AIDS. In addition, patient No. 5 had two common sexual partners with patient No. 1, and participated with them in group sex (see Fig. 2), but their blood tests are as yet serum negative. In view of their recent sexual contacts, these partners may yet become serum positive in the future. A serum-positive partner No. 11 was identified in the course of his request for a medical examination. Patients Nos. 12 and 13 were found to serum positive through contact with No. 5. An epidemiological investigation was begun and demonstrated one more chain of homosexual contacts comprising 60 persons, but whose description will not introduce additional information about the incidence of HIV in Moscow.

The sexual case history of patient No. 1 generally demonstrates the presence of foreign sexual partners from the USA and Western Europe. An examination of his sexual partners who were Moscow residents demonstrated HIV antibodies in one partner (No. 2, a passive homosexual) who had come to Moscow from another city in September 1987 to continue his studies at a medical institute. He had only three sexual contacts in his home town, but in Moscow he had 20 sexual partners within a period of one year. In addition, patient No. 2, a drug addict, took drugs intravenously. Together with his girl friend, a physician, who helped him obtain narcotics, the two of them used the same syringe without sterilizing it. Moreover, the infected person was the first to inject the narcotics. Nevertheless, two serological tests of this woman's blood (with an interval of three months) did not detect any antibodies. Thus, it is most probable that patient No. 2 was infected by patient No. 1.

The seropositive homosexuals Nos. 3 and 4 who were detected in an epidemiological investigation were also infected via the sexual route. Their sexual contacts are concisely tracked on the diagram and do not require any special description. One should emphasize that each one of them was infected after a single anal-genital relationship.

The search for the source of infection of patient No. 6 and the partners infected by him disclosed four more homosexuals with antibodies to HIV: one Muscovite (No. 10, contact in 1986), and two inhabitants of other cities with whom No. 6 had sexual relations in 1984-1985. One of them (No. 7) possibly was the source of infection for patients Nos. 6 and 9, since he himself had a large number of homo- and heterosexual relationships, including relationships with foreigners.

An additional questionnaire inquiry allowed us to establish that of the 53 homo- and bisexuals 29 (56 percent) never used condoms, 17 (32 percent) used them from time to time, and no one used them all the time.

Thus, out of the 26 investigated contacts in the first chain three turned out to be serum-positive, and 11 were serum-positive out of the 93 persons in the second chain.

As we can see from Fig. 1, homosexuals from the USSR enter into sexual contacts with those foreigners (businessmen, tourists, etc.,) who are not subject to the systematic testing as provided by Order No. 690 of the USSR Ministry of Health of September 5, 1988 "On Improving the Registry of HIV-Infected Persons and AIDS Patients" (...foreigners visiting the country for more than three months). Apparently, HIV reached local homosexuals via representatives of this population of homosexuals. That means of propagation is illustrated in Fig. 2.

Only two out of the 13 HIV-infected homosexuals from this chain indicated they had sexual contacts with foreigners, and six indicated they had sexual relations with inhabitants of other cities. Almost every infected person had an average of 20 sexual partners, inhabitants of Moscow, over the last three years which confirms that HIV-infection had become prevalent among Moscow homosexuals.

In comparing these data to the research results of 1986 [1, 2], one can say that an intensive spread of HIV among Moscow homosexuals began in 1987, although an earlier date is also possible, as indicated by the number of fatal illnesses among certain young contacted persons.

The smaller number of homosexuals engaging in sexual relations with foreigners in comparison to those who contacted fellow citizens only is apparently due to the later penetration and spread of HIV in this population in the USSR than was the case in Western Europe. Moscow homosexuals have fewer sexual partners than, for example, New York homosexuals. This has also retarded the spread of HIV in the USSR. However, the characteristics of their sexual behavior, particularly the large number of partners, the frequent changing of partners, and the complete refusal to use condoms, allow us to state that without effective methods of teaching this group safe sex the viral infection rate of such persons in the immediate years ahead might jump by several tens of percentage points.

The majority of the examined contact persons (12 out of 13) were not known as homosexuals and were not subject to systematic examinations. Since homosexuals comprise a subpopulation to whom the public takes a negative attitude, and because homosexuals themselves take a negative attitude to the practice of identifying venereal diseases, the only possible method of identifying sources of infection among them is the partner notification method. This is confirmed by the fact that whereas not one infected person was discovered in the course of a systematic testing of 226 Moscow homosexuals in 1988, the epidemiological investigations described here allowed us to identify 12 HIV-infected persons.

Thus, in order to raise the effectiveness of identifying sources of HIV infection, systematic examinations should be complemented by a wide-scale testing of contact persons that is carried out under conditions of strict confidentiality.

Conclusions

1. An intensive incidence of HIV infection among Moscow homosexuals began in the population of Moscow homosexuals in 1988.

2. The investigation of sexual partners can be sufficiently effective only through the guarantee of confidentiality.

3. A special program of medical education to prevent HIV infections should be designed that is adapted for homosexuals and bisexuals.

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UDC 612.017.1:57.04

Mechanisms of Modulating Immune Splenocyte Reactions With Macroheterocyclic Compounds

907C0833A Moscow BIOLOGICHESKIYE NAUKI in Russian No 5, May 90 (manuscript received 27 Sep 88) pp 36-41

[Article by T. O. Filippova, I. E. Britva, N. Ya. Golovenko, and Yu. A. Popkov, Odessa State University]

[Abstract] The effects of macroheterocyclic compounds with immunostimulating properties in vivo on the reactions immune splenocytes in vitro was investigated by employing male CBA mice (18-20 g) injected intraabdominally with $5 \cdot 10^8$ ram erythrocytes. The experiments were conducted at the peak of the primary response to the antigen (day 5) and included measurement of hemolysin production and number of antibody-produced cells and rosette-forming cells. The results demonstrated that the effect of the azacrown ester depends on the incubation culture composition and the concentration of the preparations used. The two concentrations of substances used, 10 μm and 100 μm, had opposite effects on the immune reactions, with the former enhancing the reactions while the latter suppressed them. Decreasing the calcium-magnesium concentration in the incubation culture or completely eliminating the cations enhanced the hemolytic activity of the immune splenocytes while reducing their capacity to form rosettes with xenogenic erythrocytes. The azacrown esters modify the in vitro immune splenocyte reactions, depending on the condition of the cell membrane, with the specific effect of the substances also dependant on the bivalent cation content of the culture. Another possible explanation of this phenomenon is that the decrease in the cation concentration causes rearrangements in the cell plasma membrane that diminish expression of the corresponding receptors. Finally, the azacrown esters that have immunostimulating properties in vivo depress the in vitro reaction of immune splenocytes in an optimal incubating culture depending on the dose. Figures 2; references 9: 5 Russian, 4 Western.

UDC 615.371:579.852.13].015.46.07

Effect of Protective Bacillus Anthracis Antigen on Formation of Immunity Following Injection With Live Anthrax Vaccines

907C0832B Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 5, May 90 (manuscript received 27 Oct 89) pp 72-75

[V. A. Abalakin, N. P. Buravtseva, B. L. Cherkasskiy, Central Scientific Research Institute of Epidemiology, USSR Ministry of Health, Moscow; Scientific Research Antiplague Institute of the Caucasus and Transcaucasus, USSR Ministry of Health, Stavropol]

[Abstract] The effects of high and low molecular weight fractions of protective antigen preparations on the formation of post-vaccine resistance was investigated on 300-350 g guinea pigs and 18-20 g CBA/Lac Sto mice immunized with live Bacillus anthracis vaccines. The effects of these different protective antigen preparations on a lethal mixture of the spores in a culture of murine peritoneal mononuclear phagocytes was also researched. The protective antigen preparations obtained from the anthrax toxin contain four fractions, with only the largest fraction exhibiting biological activity. The guinea pigs were immunized subcutaneously with either live vaccine spores alone or with the combined protective antigen, which is believed to bind to the receptor of a sensitive cell and form a new receptor that interns the lethal and protective factors and vaccine spores. The animals were then infected with 71/12 Tsenkovskiy vaccine or virulent strain 81/1. In order to study the competitive properties of antigenic preparations, the latter were added to a mononuclear phagocyte culture 10 min before the lethal mixture was added in concentrations of 1, 0.1, and 0.01 μm/ml. The results demonstrated that low molecular weight protective antigens (LMWPA) and high molecular weight protective antigens (HMWPA) have a directly opposite effect on the formation of post-vaccine immunity. LMWPA suppressed the formation of acquired immunity and inhibited the effect of the toxin on the cells by binding with a specific cell receptor. In addition, LMWPA competitively blocked the toxin's effect on mononuclear phagocytes. It was also found that administration of LMWPA with live spores reduced guinea pig mortality by 10-20 percent. This study indicated that the toxin is able to potentiate the anthrax process induced by the vaccine strains, which apparently plays a significant role in the formation of acquired resistance and is a factor contributing to the higher protective effectiveness of the live vaccine. Finally, LMWPA is able to selectively retard acquired resistance and antitoxic immunity induced by homologous strain $34F_2$. This provides the basis for suggesting the existence of antigenic differences between the protective antigens produced by STI, NVSh, and $34F_2$ Bacillae. Figures 4; tables 1; references 7: 2 Russian, 5 Western.

UDC 616.127-005.8-036.11-085.849.19-036.8-07:[616.155.3+616.152.21

Effects of Low-Intensity Laser Radiation on Leukocyte Functional Activity and Antioxidant System of Blood Plasma Following Acute Myocardial Infarct

907C0821A Moscow SOVETSKAYA MEDITSINA in Russian No 5, May 90 (manuscript received 25 Apr 89) pp 36-39

[Article by I. M. Korochkin, O. L. Barbarash, I. I. Chukayeva, G. M. Kapustina, G. I. Klebanov, S. F. Berkinbayev, M. Khalasekh, O. G. Naumov, Yu. O. Teselkin, I. V. Vinogradova, and N. P. Rechnova, Chair of Internal Diseases No. 4, Second Moscow Medical Institute imeni N. I. Pirogov; Municipal Clinical Hospital No. 13, Moscow]

[Abstract] The analgesic, anti-inflammatory, and regenerating effects of low-intensity helium-neon laser radiation have also been shown to have a beneficial effect on the contractile capacity of the myocardium. The significance of the functional activity of polymorphonuclear leukocytes, the antioxidant protection of the body, and the free fatty acid level following myocaridal infarct, and the effect of laser radiation on these processes were investigated on 92 patients with myocardial infarct who arrived at the hospital within 24 h of the attack. Patients in Group 1 were treated with helium-neon laser therapy during the attack using the LGN-201 device, 1.2 mW, 630 nm. Group 2 patients received the antioxidant drug aevit (600 mg/day for 5 days) in addition to helium-neon laser treatment. Data from constant EKG monitoring revealed heart rhythm disorders in all patients the first day following the attack. Group 3 patients were the control group. Subsequent EKG monitoring demonstrated a lower incidence of ventricular rhythm disorders in experimental Group 2. All patients, especially those in Groups 1 and 2, exhibited an increase in general antioxidant activity, but by day 7 the antioxidant activity in Group 1 was 1.9 and 1.7 times lower than in Groups 2 and 3, respectively. The results demonstrated that helium-neon laser irradiation limits the cytostatic effect of polymorphonuclear leukocytes. It also results in relative insufficiency of α-tocopherol, leading to a rise in the free fatty acid level and subsequent development of arrhythmia during the sub-critical period of the disease. Helium-neon laser therapy enhances the antioxidant properties of blood plasma, thus reducing the damaging effects of polymorphonuclear leukocytes and free fatty acids on the heart. These findings demonstrate that aevit enhances the clinical effectiveness of helium-neon laser treatment. References 20: 14 Russian, 6 Western.

UDC 616.71-006-053.2-08:615.849.19

Pediatric Bone Tumor Treatment With CO_2-Laser

907C0821B Kiev KLINICHESKAYA KHIRURGIYA in Russian No 5, May 90 (manuscript received 29 Mar 89) pp 26-27

[Article by L. V. Prokopova and N. G. Nikolayeva, Chair of Pediatric Surgery and Orthopedics, Odessa Medical Institute imeni N. I. Pirogov]

[Abstract] As part of the search for reliable means of preventing the recurrence of tumors and tumor-like dysplasias in the bones of children, CO_2-laser scanning of the residual osteal bed with the Soviet-made Skalpel-1 device (infrared wavelength 10.6 μm, 25 W) has been employed since 1984 in the surgical treatment of benign bone tumors. Patients treated in this manner healed quickly without any recurrence of the disease for the duration of the study (4 years). The results showed that limb function was restored within 4-6 months, while bone structure was not completely restored until 1.5-2 years after the operation. The findings indicate that including CO_2-laser scanning in the comprehensive treatment of benign tumors and tumor-like dysplasias in the bones of children made it possible to reduce the volume and severity of surgical intervention.

UDC 615.212.7:[547.95:547.943].015.4

Synthetic Neuropeptides: Novel Field in Anesthesiology

907C0780A Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 3, Mar 90 (manuscript received 26 Jan 89) pp 3-5

[Article by B. M. Shloznikov, A. V. Vinogradov, M. I. Titov, and V. M. Likhvantsev, Surgical Institute imeni A. V. Vishnevskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] Dalargin (Tyr-Dala-Gly-Phe-Leu-Arg), a leu-enkephalin analog, arrests the development of extrasystole while simultaneously improving hemodynamics following myocardial infarct. In the continuing search for new anesthetics without undesirable side effects, research of dalargin's antinociceptive properties demonstrated it's poor analgesic activity, three to four times weaker than that of the selective agonist FK-33824. There are two possible mechanisms of dalargin's antinociceptive action. The first is via peptide interaction with hypothetical N-opiate peripheral receptors, and the second is the probable penetration of dalargin from systemic circulation into the brain. Dalargin's mechanism of action may also be associated with the fact that its antinociceptive properties are manifest only in total muscular paralysis. The other advantages of dalargin include its marked antistress effect, antioxidant activity, and the organ protecting effects on the heart, liver, and pancreas. These results suggest that dalargin may replace narcotic analgesics for reducing pain. References 50: 23 Russian, 27 Western.

UDC 615.212.7:[547.95:547.943].015.4

Prognosing Antinociceptive Effect of Dalargin During Presurgical Period

907C0780B Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 3, Mar 90 (manuscript received 26 Jan 89) pp 5-7

[Article by O. V. Petrov, F. S. Bikmulina, V. L. Vinogradov, Ye. P. Fomchenkov, P. V. Smolnikov, and B. M. Shloznikov, Surgical Institute imeni A. V. Vishnevskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] Dalargin, a synthetic leu-enkephalin analog, works well in 86 percent of patients. The antinociceptive effect of dalargin was studied by means of its influence on somatosensory induced potentials and by changes in threshold pain sensitivity to determine why dalargin is ineffective in 14 percent of patients, and how to predict whether dalargin will affect patients before an operation. The study was performed on 40 individuals aged 21-60 years with somatosensory induced potentials recorded in response to an electric current stimulus, and threshold pain sensitivity recorded in response to heat. The induced potentials were measured 12 min before and after dalargin administration, and the results demonstrated that dalargin must be evaluated by individual reaction to the drug. The findings also indicate that the antinociceptive effect of dalargin can be reliably predicted. Figures 2; references 2 (Russian).

UDC 616.24-089.5:[615.31:547.95.547.943]-031.81-036-07

Replacing Narcotic Analgesics With Dalargin as Novel Means of General Anesthesia in Lung Operations

907C0780C Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 3, Mar 90 (manuscript received 26 Jan 89) pp 7-11

[Article by M. I. Kuzin, B. M. Shloznikov, B. V. Likhvantsev, A. A. Karelin, A. L. Tverskoy, A. V. Sitnikov, O. A. Grebenchikov, and V. I. Andreyev, Surgical Institute imeni A. V. Vishnevskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] The efficacy of dalargin as a general anesthetic was compared to that of traditional neuroleptic analgesics in 80 patients aged 26-64 years. The cohort consisted of men and women with lung cancer, tumors, tuberculoma, etc., with the following operations: lobectomy, segmented resection of the lung, pulmonectomy, enucleation of lung tumors, etc. Conventional premedication with phentanyl, droperidol, seduxen, or tubarine was followed by administration of 15.6 mg/kg·h of dalargin. General anesthesia was controlled by clinical indications and hemodynamic status. The results demonstrated that the pO_2 of arterial blood was higher in the experimental group due to the better diffusion ability of the lungs. Patients in the experimental group also experienced a shorter period of restoration of independent respiration. Dalargin has a lower deteriorating effect on the body. The findings indicate that this method is as good as or better than traditional neuroleptic analgesic in analysis of central peripheral hemodynamics, oxygen-transport, gas composition, and acid-base balance, suggesting that this treatment is effective and should find greater use in this type of operation. Tables 4, references 23: 17 Russian, 6 Western.

UDC 616.382-089.843-031:616.411-032:616-011.45

Autotransplantation of Spleen Tissue Following Splenectomy in Gunshot Wounds to Abdomen

907C0822B Leningrad VESTNIK KHIRURGII IMENI I.I. GREKOVA in Russian Vol 144 No 5, May 90 (manuscript received 20 Jul 89) pp 66-70

[Article by V. I. Pashkevich, I. N. Verevkin, V. A. Chibisov, V. M. Klipak, N. A. Kargina, and L. V. Kuzhelnaya, Leningrad]

[Abstract] Experimental trials with spleen tissue autotransplantation were performed on 12 dogs with the

goal of maintaining the body's immune defense level. Radionuclide investigation, study of histological preparations, and laboratory data demonstrated that the tissue transplants are activated 2 weeks after the splenectomy and autotransplantation of tissue. Clinical trials were then performed on 49 people with gunshot wounds to the abdomen that involved the spleen. The procedure involved implanting five to seven 2 mm thick pieces of the spleen into the greater omentum following splenectomy. General blood analysis to calculate the number of thrombocytes and determine the immunoglobulin levels in the blood was performed 1, 3, and 5 days, and then every week following the operation. Sternal puncture was performed 1 day and 2 weeks following the operation. The experimental group experienced a 23 percent complication rate with one fatality due to peritonitis and phlegmon of the retroperitoneal space, while the control group, which did not receive the spleen tissue autotransplants, had a slightly higher complication rate of 30.4 percent and one fatality due to peritonitis. Laboratory data gathered the first day following the operation showed that both groups experienced thrombocytopenia without any hemorrhaging. Thrombocytosis occurs as a reaction to blood loss and the splenectomy and was shown to last longer in the control group. In addition, neutrophilic leukocytosis also began and lasted for 2 weeks. It was also shown that anticoagulant system activity was suppressed in both groups immediately following the operation, returning to baseline levels after 2-3 weeks in the experimental group and much later in the control group. A decrease in humoral immune system indices was noted in both groups 5 days after the operation, with activation of the cellular immune system occurring 4 days later. Radionuclide scintigraphy of the spleen was performed on five patients 3 and 9 weeks and 4, 8, and 10 months later and demonstrated that the radiopharmaceutical preparation begins to act 3 weeks after the operation. These findings demonstrate that in cases of gunshot wounds where it is impossible to save the spleen and where there is no diffuse peritonitis, the operation of choice is a splenectomy with autotransplantation of spleen fragments into the greater omentum. Tables 1; references 6: 5 Russian, 1 Western.

UDC 611-018.8-032:611.82]:599.323.4

Transplantation of Human Embryonal Nerve Tissue Into Spinal Cord of Adult Rats

907C0822A Leningrad ARKHIV ANATOMII, GISTOLOGII I EMBRIOLOGII in Russian Vol 98 No 5, May 90 (manuscript received 6 Jul 89) pp 22-26

[Ye. G. Gilerovich, Ye. A. Fedorova, and V. A. Otellin, Department of Morphology, Experimental Medicine Institute, USSR Academy of Medical Sciences, Leningrad]

[Abstract] This study was undertaken to determine the developmental aspects of a human embryonal nerve tissue transplant into a rat spinal cord. The anterior cerebral vesicle wall of an 8-10 week old aborted human embryo consists of cells at various stages of maturity and has been shown to graft well into mammalian spinal cord homotransplants. In this case, the human embryonal nerve tissue was transplanted onto the spinal cord of 68 adult Wistar rats weighing 200-250 g. Morphological studies performed 2, 3, 4, 8, and 12 weeks after the operation revealed that the ventricle region has nondifferentiated neuroepithelial cells, which are the precursors of nerve and glial cells, that are capable of mitotic division. Results of this study show that the proliferation processes are characterized by the same morphological transformation in xenotransplants into the spinal cord as those observed in homotransplants. In addition, it was shown that the human embryonal nerve tissue transplants grow well in the spinal cord without heavy scarring only when they are oriented correctly. The results also demonstrated that grouping of neuroepithelial cells into rosellas occurs while mitotic division of the cells ceases during the first month of observation, in contrast to normal embryonal histogenesis. The process of differentiation of cellular elements from transplanted pieces of embryonal human brain occurs without immune suppression through the second month after transplantation with intensive neuropile formation. The neuroblasts subsequently die in the third month due to chronic immune reaction. The ultimate goal of these studies is to develop methods for restoring the integrity of damaged spinal cords by using switching centers. Figures 2; references 12: 6 Russian, 6 Western.

UDC 616.12-089.843-089.168.2

First Clinical Heart Transplant Experiment

907C0822C Moscow GRUDNAYA I SERDECHNO-SOSUDISTAYA KHIRURGIYA in Russian No 5, May 90 (manuscript received 7 Sep 89) pp 8-12

[Article by V. I. Shumakov, E. N. Kazakov, M. L. Semenovskiy, A. Sh. Khubutiya, A. Ya. Kormer, E. M. Nikolayenko, V. V. Chestukhin, Ye. V. Kolpakov, N. K. Zimin, A. G. Dolbin, Yu. G. Matveyev, I. A. Kozlov, G. M. Mogilevskiy, O. A. Giorgadze, S. I. Vorontsov, A. I. Kryuchkov, S. Yu. Shemakin, S. I. Panin, B. M. Kopelev, and S. L. Inozemtsev, Transplants and Artificial Organs Scientific Research Institute, USSR Ministry of Health, Moscow]

[Abstract] The article analyzes the first clinical experience in orthotopic allotransplantation of the heart from July 1986 through July 1989. To date, 27 heart transplants have been performed, with 26 patients receiving the donor heart immediately, while one patient received an artificial heart for 3.5 days while awaiting a compatible donor heart. The first successful transplant was performed 12 March 1987, with that patient and ten others still living. All of these patients have a good quality of life. Nine of them are now at home, while two are presently situated in a rehabilitation institute. The most urgent problems lie in selecting the recipients and

determining indications and contraindications, while obtaining a compatible donor heart has been assessed as the most difficult problem. Another pressing matter is that of the infections that arise and are difficult to combat due to the use of the anti-rejection drugs. This problem alone resulted in the deaths of five patients. Following the operation, the patients were divided into three groups based on the nature of restoration of hemodynamics and the transplanted heart function. Eleven patients were in good condition, with hemodynamics stabilizing by the end of day 2. Eight patients experienced right ventricle insufficiency, with 5-7 days required for hemodynamics to stabilize. Seven patients died within a few days of the operation for various reasons. The immune system suppressants cyclosporin A, methyl prednisolone, and azathioprine were employed to prevent rejection. Most patients had two to three slight rejection reactions, while four patients had moderate to serious reactions that were easily arrested with one injection of methyl prednisolone per day for 3 days. One patient experienced a chronic reaction and subsequently died. Cyclosporin A was demonstrated to be toxic to the kidneys, liver, and pancreas, and is now being used only after the transplant. In addition to these general results, the first Soviet experience in a two-stage (artificial, then donor heart) transplant is analyzed. The findings of these studies all suggest that heart transplants are a realistic method for managing the terminal stage of congestive cardiac insufficiency. Tables 1; references 14: 4 Russian, 10 Western.

UDC 616.98:579.843.95]-078.73

Human IgG Fc-Site Receptor in Tularemia Etiological Agent

907C0832A Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 5, May 90 (manuscript received 9 Mar 89) pp 11-13

[V. N. Neklyayev, A. S. Novokhatskiy, and Kh. P. Gamleshko, Rostov-on-the-Don Scientific Research Anti-Plague Institute]

[Abstract] Four strains of Franciseila tularensis, the etiological agent of tularemia, were employed in a study to determine whether F. tularensis has an Fc receptor site to human IgG like that found in Staphylococci, Streptococci, and other bacteria. The dot blot and Western blot were performed to test for Fc receptors in F. tularensis strains 15, 21/400, 128, and a capsule-free variation of the LVS vaccine. The results demonstrated that human IgG Fc fragments bind with F. tularensis antigens fixed on a nitrocellulose membrane. The findings also indicated that the Fc receptor of F. tularensis consists of two components with molecular masses of 40,000 and 67,000, and that these components compete with Staphylococcus aureas protein A for the binding site on the human IgG Fc section. In addition, all strains were shown to have a receptor to the Fc site of human IgG on the cell wall. Finally, the Fc receptor of F. tularensis may play a vital role in tularemia pathogenesis. Figures 1; references 8: 1 Russian, 7 Western.

UDC 578.832.1/577.213.3

Construction and Expression of Influenza Hybrid Hemagglutinin Gene Subtype H1/H3 in Escherichia Coli

907C0752A Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 24 No 2, Mar-Apr 90 (manuscript received 11 May 89) pp 408-416

[Article by V. A. Petrenko, S. M. Kipriyanov, G. A. Mizenko, A. M. Yeroshkin, G. F. Sivolobova, M. Yu. Rukavishnikov, Z. A. Akimenko, A. N. Boldyrev, and V. V. Kalashnikov, All-Union Scientific Research Institute of Molecular Biology, "Vektor" Scientific Industrial Association, Koltsovo, Novosibirsk Oblast]

[Abstract] Conventional genetic engineering technology was utilized in the construction and expression of a hybrid influenza virus hemagglutinin (HA) gene, in which a part of the surface epitope of HA H1 was replaced by a homologous H3 sequence. Plasmid pHH13 was constructed from plasmid pUR292 for microbial synthesis in Escherichia coli for production of hybrid HA (H1/H3) as a fusion protein with β-galactosidase. The chimeric protein reacted with antibodies specific for H1 and H3 determinants. Additional immunochemical studies demonstrated that the reaction evidently involved antibodies directed against the C-terminal HA domains. Figures 7; references 26: 14 Russian, 12 Western.

UDC 576.8.097.29

pH-Dependent Structure and Interaction of Isolated Ricin Subunits

907C0752B Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 24 No 2, Mar-Apr 90 (manuscript received 29 May 89) pp 431-437

[Article by A. G. Tonevitskiy, S. Yu. Venyaminov*, T. L. Bushuyeva, N. A. Maysuryan, and M. A. Goncharskaya, All-Union Cardiological Scientific Center, USSR Academy of Medical Sciences, Moscow; *Protein Institute, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Studies were conducted on the effects of pH 7.0 (0.1 M sodium phosphate buffer) and 4.0 (0.1 M sodium acetate buffer) on the structure and interaction of ricin A and B subunits. Circular dichroism and intrinsic fluorescence spectra demonstrated that once the single disulfide bond between the A and B subunits was broken there was no significant interaction between the subunits at the secondary or tertiary level at pH 7.0. In addition, neither the intact ricin molecule nor the subunits underwent any structural changes as a result of the change in pH from 7.0 to 4.0. However, changes in thermostability were noted. Stability of the native molecule increased by 12°C in an acidic environment, while that of the A and B subunits was some 25-35°C below that of intact ricin regardless of pH. In addition, as the pH decreased the K_a for the association of A and B subunits increased due to hydrophobic interactions. These observations suggest that the cytotoxic effects of ricin, which require dissociation of the subunits for ingress into cells, apparently involve organelles with neutral or slightly alkaline pHs which would prevent subunit association. Figures 6; references 18 (Western).

UDC 575.313

Cloning and Regulation of Gene Expression of *Eco*RV Restriction and Modification System

907C0752C Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 24 No 2, Mar-Apr 90 (manuscript received 23 Jan 89) pp 438-447

[Article by A. N. Kravets*, M. V. Zakharova, A. S. Solonin, N. P. Kuzmin, V. I. Tanyashin, L. I. Glatman**, A. F. Moroz**, and A. A. Bayev, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino, Moscow Oblast; *Kiev Scientific Research Institute of Epidemiology and Infectious Diseases imeni L. V. Gromashevskiy, Ukrainian SSR Ministry of Health; **Scientific Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Abstract] A series of recombinant plasmids belonging to different compatibility groups were engineered to bear *Eco*RV restrictase and methylase functions. Expression in Escherichia coli of vector pVE8 demonstrated that the promoter was comparable in efficiency with phage λ early promoters and operated at 70 percent efficiency of the P_L promoter. Efficiency of the methylase gene promoter was two-fold lower than that of the restrictase promoter. In addition, in cases in which *Eco*RV was under the additional control of phage λP_R promoter, a 30- to 40-fold increase in restrictase synthesis was observed in conjunction with inactivation of the temperature sensitive repressor of phage λ-c1857. In the latter cases, production of *Eco*RV restrictase amounted to about 10 percent of the total cell protein content. Figures 3; tables 3; references 39: 13 Russian, 26 Western.

UDC 577.323.435

'Samson' Software Package for Analysis of Primary Structure of Biopolymers

907C0752D Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 24 No 2, Mar-Apr 90 (manuscript received 26 Jul 89; after revision 16 Oct 89) pp 524-529

[Article by S. Ye. Vernoslov, A. S. Kondrashov, M. A. Roytberg, S. A. Shabalina, O. V. Yuryeva, and N. N. Nazipova, Scientific Research Computer Center, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Cursory description is provided of a software package intended for analysis of the primary structure of biopolymers, with full description available under the same title by S. Ye. Vernoslov et al., Nos. 1 and 2, Pushchino, ONTI NTsBI [as published], 1989. The software, consisting of 20 application programs, is designed for power users in molecular biology interested in theoretical sequence analysis. The applications are divided into six categories dealing with manipulation of the basic data, estimation of the various sequence characteristics, identification of sequences with defined characteristics, modeling of various molecular processes, sequence comparison, and specialized applications, such as search for distorted sequences in DNA. References 9: 5 Russian, 4 Western.

UDC 577.113.4

Use of Filamentous M13 Bacteriophage in Protein Engineering

907C0752E Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 24 No 2, Mar-Apr 90 (manuscript received 7 Aug 89) pp 530-535

[Article by A. A. Ilichev, O. O. Minenkova, S. I. Tatkov, N. N. Karpyshev, A. M. Yeroshkin, V. I. Ofitserov, Z. A. Akimenko, V. A. Petrenko, and L. S. Sandakhchiyev, Scientific Research Engineering Institute of Biologically Active Substances, "Vektor" Scientific Industrial Association, Berdsk, Novosibirsk Oblast]

[Abstract] An analysis was conducted on the application of phage M13 in protein engineering, with the primary view of creating artificial immunogens (vaccines) in the form of M13 bearing a foreign epitope on its surface. Initial steps consisted of construction of ampicillin-resistant M13B by insertion of a fragment of plasmid pBR327 DNA, containing β-lactamase gene, into a polylinker region of phage M13mp10. M13B, in addition, has a BamHI site in gene VIII which encodes the envelope B protein. Introduction of a synthetic DNA segment coding for a model peptide into the BamHI site resulted in the appearance of the model peptide on the N-terminal terminus of the B protein. Introduction of the foreign peptide into the envelope yielded viable M13 phages with diminished infectivity for Escherichia coli, demonstrating that this approach to engineering of vaccines is quite promising. Figures 4; references 19: 7 Russian, 12 Western.

UDC 577.352.38:66.085

Effect of Electromagnetic Radiation on Sarcoplasmic Reticulum Membrane

907C0833B Moscow BIOLOGICHESKIYE NAUKI in Russian No 5, May 90 (manuscript received 4 Jul 88) pp 41-46

[Article by P. Kaplan, Yu. A. Kim, B. S. Fomenko, V. Mezeshova, Ya. Legotskiy, and V. A. Pechatnikov, Institute of Biological Physics, USSR Academy of Sciences]

[Abstract] The effects of electromagnetic radiation on sarcoplasmic reticulum preparations depending on the temperature were investigated using sarcoplasmic reticulum obtained from the white muscle of a rabbit. A study of the relationship of sarcoplasmic reticulum Ca^{2+}-ATPase activity to various temperatures in Arrhenius coordinates revealed that electromagnetic radiation had no significant effect on sarcoplasmic reticulum enzyme activity, except at 18°C, where activity decreased by 27 percent due to a 1.6°C temperature drop. Ca^{2+}-ATPase activity returned to baseline levels after the electromagnetic radiation was switched off. Other studies demonstrated that there was a 25 percent reduction in Ca^{2+} transport into the vesicle. In addition, fluorescent probes used to study the effect of electromagnetic radiation on the structural organization of the sarcoplasmic reticulum membrane demonstrated diminished activity at 18°C. Electromagnetic radiation used at 18°C causes some additional changes that are manifested in the attenuation of membrane functions, including a reduction in Ca^{2+} activity, diminished ATPase activity, barrier properties, weakening of intermolecular interactions, etc. Figures 1; tables 1; references 11: 5 Russian, 6 Western.

UDC 612.81

Interhemispheric Electroencephalogram Asymmetry as Correlate of Negative Emotional Stimuli

907C0751A Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 16 No 2, Mar-Apr 90 (manucript received 10 Apr 87; after revision 27 Mar 89) pp 22-30

[Article by V. F. Konovalov and I. S. Serikov, Institute of Biological Physics, USSR Academy of Sciences, Pushchino]

[Abstract] An analysis was conducted to determine correlation parameters between asymmetry of α and θ patterns on electroencephalogram (EEG) and negative stimuli in 13 right-handed males, 25-35 years old. The test system involved presentation of neutral and negative (80 V electric stimulus to finger) verbal stimuli with concomitant assessment of occipital and temporal EEG asymmetry. Baseline studies demonstrated a positive coefficient of asymmetry of the occipital α waves in 77 percent of the subjects, i.e., the α energetic profile was dominant in the right hemisphere, and 23 percent presented with negative coefficient indicative of the left hemisphere predominance. In the case of temporal recordings, a positive coefficient of asymmetry was observed in 46 percent of the subjects. Analysis of θ occipital and temporal recordings showed that positive coefficients of asymmetry prevailed in 92 and 100 percent of the subjects, respectively. Emotional stress was found to induce three types of change in EEG asymmetry. One type consisted of positive coefficients of asymmetry in the occipital regions in some subjects and in the temporal region in others. Another type involved negative occipital and temporal coefficients. Finally, a third type consisted of a mixed-type response characterized by equivalent positive and negative asymmetry of occipital and temporal α waves. Changes in the α and θ waves were greater in the occipital than in the temporal recordings, with changes in α exceeding changes in θ. The higher information content of the α waves was evidently due to their dominance in the brain wave spectrum and greater uniformity and correlation with the degree of activation of subcortical formation. In addition, the results indicate that EEG asymmetry may be used to assess the effects of negative emotional stress. Figures 4; references 32: 28 Russian, 4 Western.

UDC 612.014.421-073.97:612.82]:681.3

Comparison of Expert and Automatic Electroencephalogram Classification

907C0751B Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 16 No 2, Mar-Apr 90 (manucript received 9 Jan 89) pp 31-40

[Article by Ye. A. Zhirmunskaya and I. I. Goncharova, All-Union Scientific Research Institute of Technical Esthetics, Moscow]

[Abstract] A comparison was conducted on electroencephalogram (EEG) pattern classification based on expert opinion and results of computer processing. The EEG recordings were obtained from 98 clinically healthy men and women ranging in age from 25 to 46 years. The cohort consisted of 74 right-handed, 11 left-handed, and 13 ambidextrous individuals. Factor analysis of 15 EEG physiological groups and correlation with automatic spectrum analysis revealed that expert classification is based on not only subjective interpretations, but is supported by unambiguous objective criteria. Accordingly, the findings indicate that a computer-based probability-density approach to EEG pattern classification constitutes a reliable and rapid aid to EEG interpretation. Figures 3; tables 2; references 12: 6 Russian, 6 Western.

UDC 612.821:616.891

Functional Enhancement of Vision in Healthy Subjects by Synthetic Analog of Corticotropin Fragment

907C0751C Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 16 No 2, Mar-Apr 90 (manucript received 1 Mar 88) pp 151-154

[Article by V. V. Kolbanov, V. V. Nakorchemnyy, A. A. Nevzorov, V. N. Nezavibatko, M. A. Ponomareva-Stepnaya, L. Yu. Alfeyeva, and V. N. Potaman, Military Medical Academy imeni S. M. Kirov, Leningrad]

[Abstract] The effects of an adrenocorticotropin hormone$_{4-10}$ (ACTH) synthetic analog (Met-Glu-His-Phe-Pro-Gly-Pro) on vision were investigated on the authors at weekly intervals following intranasal instillation of 400-500 μg/person of the peptide in a double-blind study. Testing conducted 40-50 min after instillation demonstrated that in each case there was noticeable improvement in light sensitivity, color perception, and functional flexibility. The changes could not be attributed to any subjective factors or inadvertent training, but seemed to be correlated with the generally acknowledged improvement in central nervous system function induced by ACTH fragments. Tables 2; references 14: 11 Russian, 3 Western.

UDC 616-07:614.881+616-08-031.81

On the Creation of a Mobile Multipurpose Diagnostic and Consultative Treatment Center

907C0806A Kiev VRACHEBNOYE DELO in Russian No 4, Apr 90 pp 1-4

[Article by A. M. Serdyuk, A. I. Neronov, L. G. Rozenfeld, S. K. Ternovoy, and B. S. Oleynik]

[Text] Complicated medical equipment is used today for early diagnosis of disease. Physicians and engineers must be involved in the solution of this major problem. The many years experience of Western and Soviet investigators testifies to the need to create diagnostic centers. The basic tenets of the organization of the latter in the USSR are set forth in the resolution of the USSR Council of Ministers of 19 May 1988, No. 628, "On the organization of medical diagnostic centers," and the decree of the USSR Ministry of Health of 15 June 1988, No. 480. In keeping with these documents, three diagnostic centers have been created and are currently operating in the Ukrainian SSR (Kiev, Donetsk, Lvov), and another three will be placed in service in 1990-1991. By 1995, 23 diagnostic centers will be organized in the republic.

However, the ecological situation in the Ukraine, aggravated by the long term consequences of the accident at the Chernobyl power plant, the outbreak of childhood diseases in Chernovtsy, and other adverse circumstances, shows that such a pace of creation of the major independent diagnostic centers cannot cope with the current problems of medical services for the republic. Furthermore, the need to outfit even the major clinics with the necessary quantity of expensive, chiefly imported, diagnostic equipment in the coming years is apparent. For example, computer tomography at the diagnostic centers can be done for only 30-50 percent of the patients at clinics of the given territory who require this investigation [4].

Accordingly, the expert council of specialists of the Ukrainian SSR Ministry of Health on organization of the functioning of the diagnostic centers arrived at the conclusion that it is essential to install diagnostic equipment in mobile vehicles. The efficiency of mobile diagnostic facilities is beyond question. As early as 1963, Prof. A. I. Kolomiychenko was examining children in the Ukrainian SSR by means of a special bus, equipped with audiometers. Progressive radiological and especially fluorographical booths are common, there are mobile ophthalmological facilities, and versions of a thermographic-computer system in a mobile thermodiagnostic booth in LiAZ-677 and Ikarus buses [1].

The use of an automated thermodiagnostic complex as a self-standing element (bus, ocean and river vessels, railroad car) has made it possible to reduce the work of care providers in medical examination and the time for medical investigation and preventive examination of workers in rural locality, and also when using the on-call dispatched method of operation; to quickly obtain objective information to draw up plans of individual examination and treatment of each patient; to build up data on the patients in specific data banks and transmit them to the treatment and prevention institutions; to exercise systematic supervision of the course of medical examinations and followup care; and to use this method in medical institutions not having stationary thermodiagnostic rooms [2].

The mobile computer tomograph CT-MAX, installed in a special bus (Metromaks complex), has proved to be highly effective in the emergency situation connected with the earthquake in Armenia. The advantage of such layout was its compactness and maneuverability and the possibility of covering great distances [4]. However, these mobile diagnostic facilities are "monodiagnostic," which does not meet the needs of practical public health.

The search for other organizational forms of the diagnostic process and ways of improving it has demonstrated the need to create a radically new and unique mobile multipurpose diagnostic and consultative treatment center (PMDLKTs), built in railway cars. Such a center could implement a comprehensive approach to optimal utilization of the diagnostic apparatus, combined with mobility and maximum proximity to the population being served. Given the fact that those who are to be examined reside in the zone of the aftermath of the Chernobyl disaster (hamlets, small villages), a train car for a daytime hospital has been included within the makeup of the PMDLKTs, calculated for short term hospitalization of around 20 people, which is the reason for the word "treatment" in its designation.

The PMDLKTs was organized by the Ukrainian SSR Ministry of Health, along with the Southwestern Railway Authority (YuZZhD). Its sources of financing are allocations from the budget of the Ministry of Health of the republic and the YuZZhD authority on an equal footing. The maintenance costs of the PMDLKTs consist of the expense for logistical support of the train, the cost of the diagnostic and treatment procedures, including the salaries of the personnel, the depreciation of the equipment, instruments, and implements, the cost of medical materials, drugs, and so forth. Depending on the specific mission, the train consists of 8-12 cars, including three compartment cars for the medical personnel and cars for a pharmacy, for the engineers and technicians and repair room, a dining car, and the day hospital. In future, there are plans to create a car for a computer tomograph, the preliminary design work of which has been carried out by the Kharkov Institute of Railway Transport Engineers on commission from the Ukrainian SSR Sovmin. In outfitting the PMDLKTs with equipment, we considered the circumstance that 65-80 percent of the diagnoses are made by means of therapeutic diagnostic methods, and the identification of the majority of diseases, especially in the early and preclinical stages, cannot be considered reliable without the use of such methods [3]. Yet the inevitable radiation burden which this entails runs counter to the principles of medicine and is especially

undesirable when examining persons who have been living in the zone of aftermath of the Chernobyl disaster. These factors were included as much as possible in the outfitting of the diagnostic departments of the PMDLKTs, where nonionizing methods of radiation diagnosis and various ultrasonic and thermographic methods are supposed to predominate. Moreover, there are mammography, endoscopy, immunodiagnostics, biochemical and clinical laboratories in use. Specialists work in the PMDLKTs: gynecologists, cardiologists, endocrinologists, hematologists, gastroenterologists, ophthalmologists, otolaryngologists, as well as physicians who are skilled in nontraditional and folk healing methods.

Thus, the members of several professions are involved in the identification of disease, which enables a successful differential diagnosis, choice of the proper method of treatment, and prognosis. By order of the Ukrainian SSR Ministry of Health, the most qualified medical personnel are participating in the work of the PMDLKTs and an expert council has been formed for supervision and organizational assistance. One of the tasks of this council and the consultants was to create an algorithm of diagnostic studies in specific instances. During this project, we assumed that the diagnostic methods and combinations thereof should meet the following requirements.

1. Independence of application: production of necessary and sufficient information, interpretation of which would allow a reliable diagnosis.

2. Harmless use (no side effects or complications, including carcinogenic or teratogenic ones) both in the near and the long term (70-80 years); noninvasive and painless diagnostic procedures; a comfortable examination.

3. The investigation should not cause accelerated aging effects.

4. Specific and highly sensitive methods of investigation.

5. Minimum time for the examination.

6. Maximum ecological cleanliness.

7. Possible use of other diagnostic methods.

Furthermore, we proceeded on the understanding that, while having a computer tomograph or complex ultrasonic system, it is important to clearly determine the indications for an investigation. Complex diagnostic equipment should be used only in those cases where a diagnosis is not possible without it [5]. By special arrangement of the Ukrainian SSR Ministry of Health, priority hospitalization of patients has been provided on the itinerary of the PMDLKTs in special departments of the municipal, central regional and oblast hospitals and in the clinics of scientific research institutes. In order to improve the organization of the work of the PMDLKTs, several days in advance of the arrival of the train at its destination persons are sent out to cooperate with the local medical workers in the preliminary triage of persons for investigation, depending on the indications.

The expensive diagnostic equipment should be used intensively, given the standard depreciation of around 7-10 years. Thus, with a four-shift operation (i.e., virtually round the clock), the capital and operating expenses per hour are reduced to less than ¼ [6]. The work time of the medical personnel of the PMDLKTs is set by the chief physician in the range of 8-12 h per day (as many as 16 h, in exceptional cases), with contract salary. This is the reason for the high pace and intensity of the working rhythm of the personnel of the PMDLKTs, the large number of investigations performed, the short time of an investigation, and also the need for a high professional level of the workers and creation of maximum advantages for their working conditions and salaries.

Thus, the experience with the use of the PMDLKTs testifies to the expediency of its creation. Modern diagnostic equipment, rationally arranged in the PMDLKTs, is in optimum use. Given the extensive railway network, the operation of such a mobile center can successfully solve the problems of early recognition of disease and differential diagnosis in complicated cases and emergency situations.

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616-001.28-036.11-085.33

Combination Antibiotic Treatment of Acute Radiation Sickness in Chernobyl Accident Victims

907C0126 Moscow ANTIBIOTIKI I KHIMOTERAPIYA in Russian in Russian Vol 34 No 7, Jul 89 pp 555-558

[Article by A. Ye. Baranov, T. V. Shishkova, T. G. Protasova, and T. I. Davydovskaya]

[Text] Acute radiation sickness (ARS) induced by a single radiation exposure at a dose of 1 Gy or more is an

illness that stems from injury to the cellular structures of organs and tissues with a high degree of physiological regeneration. Persistent clinical and morphological symptoms of this disease include acute hypoplastic hemopoiesis (bone marrow syndrome) and associated peripheral blood pancytopenia. A reduction in the neutrophil count to 750-500 per 1 μl or less results in infectious complications whose frequency and severity are related to the degree and duration of neutropenia.

A specialized hospital treated 115 ARS patients with degrees of severity I-IV who were victims of the Chernobyl AES accident (see the table). Treatment of bone marrow syndrome was based on the principles of anti-infectious antibacterial therapy (isolation, intestinal decontamination, systemic administration of antibiotics) and supportive therapy (erythrocyte mass and thrombocyte mass transfusion). All of the patients with ARS of severity degrees II-IV were placed one by one into conventional hospital wards equipped to provide aseptic conditions for the patients (ultraviolet sterilization of air, strict personnel and patient observance of surgical-level aseptic regulations). They were fed conventional food. Parenteral feeding was provided for patients with intestinal syndrome.

Outcomes of ARS Cases in Relation to Disease Severity

		Number of patients		
Degree of bone marrow syndrome severity	Dose, in Gy	Total	Remaining alive	Died
I	0.8-2.1	31	31	—
II	2.0-4.0	43	42(1)	1(1)
III	4.2-6.3	21	14	7(4)
IV	6.0-16.0	20	1(1)	19(8)
Totals		115	88(2)	27(13)

Note: Numbers in parentheses indicate patients with "major" infections (sepsis, pneumonia).

Prevention of endogenous infections was accomplished by the administration of 6 tablets daily of biseptol-480 and 5 million units of nystatin per day beginning one to three weeks prior to the onset of agranulocytosis (neutrophil count less than 500 per μl). In the event of fever, two or three broad-spectrum antibiotics—one each from the aminoglycosides (gentamycin or amicacin), the cephalosporins (cephazolin or cephoperazone), or the semisynthetic penicillins with antipyocyanic activity (carbenicillin or piperacillin)—were administered intravenously at maximum doses. Amphotericin B (fungizone) in a dosage of 1 mg/kg daily was administered intravenously in some cases to prevent fungal infections. Bacteriological tests were done two to three times a week—or less frequently by blood, urine, or fecal cultures or mouth and nose smears—to test bacterial flora (elective media) and fungi (Sabourard's medium).

The effectiveness of anti-infection therapy was evaluated by comparing, on the one hand, several clinical indices that in one way or other could have had a bearing on the onset, diagnosis and treatment of infection to, on the other, the culture results obtained from living patients as well as during autopsies (in the event of death). In order to exclude or confirm bacterial, mycotic or viral infections at the time of death, a record was made of histological and bacteriological tests of internal organs and indications of mucous membrane infections, but only in the event that bacteria had penetrated deep underlying tissues. A sepsis diagnosis was considered confirmed if the aforementioned conditions were observed during autopsy; in living patients, it was confirmed if a repeated blood culture of the etiological agent was obtained and if fever with chills was present.

Out of the 27 deceased persons, 22 died within 14 to 34 days after exposure with profound neutropenia (less than 500 neutrophils per 1 μl). Five patients died between days 48 and 99, even after restoration of hemopoiesis. The infectious complications were analyzed separately in these two groups since the patients had different levels of neutrophils at the onset of infection. Of the 22 persons who died within the earlier period, extensive beta-burns were the primary factor of thanatogenesis in 20 victims. In two, those burns were combined with thermal burns. Moreover, autopsies disclosed sepsis in seven victims and pneumonia in one victim.

Individuals with infection symptoms (8 patients) did not differ appreciably from those without such symptoms (14 patients) in terms of survival time following exposure to radiation (15 to 34 days), duration of neutropenia with a cell count of 500 per 1 μl or less (6-22 days), severity of oropharyngeal syndrome (II-IV degree), duration of oral cavity necrosis retention (3-23 days), area and depth of burns (II-III degree, 10-70 percent), extent of intestinal syndrome (0-IV degree), actual duration of enteral sterilization during the cytopenia period (0-7-8 days), or duration of intestinal syndrome.

At the same time, eight of the patients in whom infections were confirmed upon autopsy did exhibit some predisposing factors to infection. For example, two patients were observed to have ulcerative-necrotic esophagitis, and three patients had ulcerative necrotic lesions of deep sections of the upper respiratory tract that were inaccessible for treatment. Two patients had thermal burns of the respiratory tract, something that was not found in any of the 14 patients who did not exhibit infection upon autopsy.

In analyzing the type of fever as one of the symptoms of a presumed infection, we found that the temperature in six of the 22 patients who died in the earlier period had remained normal until the onset of agranulocytosis, whereas the temperature rose in all of the 22 patients

with or without infection symptoms and remained moderately high (38-39°C) or higher (39-41°C).

Fourteen of the 22 patients exhibited subfebrile temperatures during the first days after radiation exposure. This coincided both with radiation burns that were more serious and exhibited greater coverage as a result of a large radiation dose and with earlier and faster passage into agranulocytosis. These patients in particular were found to have bacterial and fungal infections (six cases of sepsis and one case of pneumonia), whereas no further bacterial infections were found in the six persons who had normal temperatures during the first days of the disease, with the exception of one patient who was placed on a prolonged period of artificial pulmonary ventilation (bacterial and cytomegaloviral sepsis).

The administration of broad-spectrum antibiotics in the context of persistent agranulocytosis did not normalize body temperature in any of the 22 patients who died in the early period. Therefore, such administration could not be considered a criterion of effective or ineffective anti-infection therapy.

Fungizone was given to six patients, three of whom exhibited Candida cultures prior to the administration of that drug (cultures taken from of the mouth in two patients, and from the blood of one patient). There was a notable drop in the temperature in two out of the three patients who were given fungizone for not less than five days in a row or at intervals of 1 to 2 days. Not one of those patients exhibited fungal infections upon autopsy. Two patients who died of fungal sepsis did not receive fungizone.

Five of the 13 victims who died in the early period exhibited approximate clinical symptoms of pneumonia of bacterial, fungal, or viral origin. Eight patients with a hemorrhagic-fibrinosis picture of the disease (caused by microcirculation disturbances) had pneumonia of a radiation or intoxication origin. No bacteria were found in their lungs upon autopsy.

All of the patients who died at later dates between days 48 and 99 (five persons) exhibited infection complications at the time of death: Two had fungal-bacterial sepsis, one patient had bacterial + cytomegaloviral sepsis, and two patients had pneumonia, one of which was a bacterial pneumonia and the other cytomegaloviral pneumonia. We can assume that the tenacious Candida fungal contamination of the oral mucosa in two patients against a background of long-term large-dose steroid therapy (treatment of beta skin burns) with elevated blood sugar over the last 20 to 22 days contributed to the development of fungal septicemia. Cytomegaloviral infection was detected in three of the 11 patients in whom marrow transplants were performed. Of the 20 patients with IV-degree ARS, there was one survivor (8.7 Gy dose) who exhibited sepsis during the agranulocytosis period. The sepsis was bacteriologically confirmed (E. coli and Candida blood cultures).

A retrospective comparison of clinical and laboratory data showed that 13 patients were diagnosed to have sepsis while alive. Sepsis was confirmed (upon autopsy) in only four of those patients. Sepsis in seven patients was recognized posthumously, but was not diagnosed while the patients were alive, although intensive empirical anti-infection therapy was performed. The impossibility of employing highly sensitive, express laboratory diagnostic procedures (insufficient diagnostic equipment) to identify the onset of infection at the peak period of illness resulted in the use of empirical antibacterial therapy for most of the extremely severe febrile patients with suspected infection. This therapy was continued or was subsequently changed in some patients in accordance with the ex juvantibus principle with results that were absent or difficult to evaluate.

All 43 patients with II-degree ARS exhibited agranulocytosis for an average of 23 to 35 days. In some of these patients, since there was no rise in temperature, they did do not receive antibiotics. Only two antibiotics were administered to one-third of the patients (gentamycin and cephazolin), after which their temperature was normal. The temperature in most patients during the agranulocytosis period increased to pre-febrile levels. In half of the patients the temperature normalized only after they came out of the agranulocytosis period. One of the patients in this group (with severe local radiation lesions) exhibited sepsis caused by Staphylococcus epidermidis. There were some cases of aphthous stomatitis, esophagitis, focal pneumonia, follicular angina, etc., that were cured with antibiotics. Between days 31 and 60, one-fifth of the patients exhibited elevated transaminases without an increase in the bilirubin level. This was evaluated as viral hepatitis. Bacteriological test data will be the topic of subsequent reports.

Approximately one-third of the patients exhibited early signs of Herpes simplex infection (those with III-IV-degree ARS). The use of acyclovir in those cases yielded good results.

Thus, the described regimen of a primarily empirical antibiotic therapeutic approach turned out be rather effective. There were no cases of sepsis or severe pneumonias in patients with II-degree ARS or in two-thirds of the patients with III-IV-degree ARS. The regimen we employed corresponded to the that adopted globally for the treatment of severe post-radiation and cytostatic cytopenias. However, this was the first time such a regimen was employed with a such a large of group of individuals with radiation injury who were admitted for treatment at the same time. The control data is literature that indicates that if similar patients are not given antibiotics, as was the case in Japan, or if the antibacterial therapy is not sufficiently broad in spectrum, the mortality structure changes considerably. A similar analysis of our material on the Chernobyl AES accident was undertaken by American colleagues and demonstrated a considerable increase in the average lethal dose.

UDC 539.1:631.811+551.5

Radionuclide Entrance Into Wheat and Alfalfa Crops Depending on Species and Aerosol Properties

907C0834B Moscow DOKLADY VSESOYUZNOY ORDENA LENINA I ORDENA TRUDOVOGO KRASNOGO ZNAMENI AKADEMII SELSKOKHOZYAYSTVENNYKH NAUK IMENI V.I. LENINA in Russian No 5, May 90 (manuscript received 24 Oct 89) pp 33-36

[Article by V. G. Malikov, B. I. Zhukov, P. A. Polushin, and A. V. Udalov, North Caucasus Scientific Research Institute of Phytopathology]

[Abstract] The migration of ^{60}Co, ^{65}Zn, and ^{134}Cs from various solid and liquid aerosols into winter wheat and alfalfa plants was researched. The radioactive particles were applied to the crops while the wheat was flowering and alfalfa was budding at a density of 2 g (1 ml)/m^2, six times. The results demonstrated that the biological mobility of the radionuclides depended on the chemical composition of the sorbent particles, with the liquid particles shown to contaminate wheat to a much greater degree than any of the solid particles. In addition, the amount of radionuclides that accumulate in products is determined by the type of aerosol, which is associated with varying distributions, strength of radionuclide fixation on the particles, and the chemical composition of the particles. The findings demonstrate that these parameters must be considered in predicting the radioactive contamination of agricultural crops. Tables 4.

UDC 616.98:578.833.26]-092.9-085.275.2-036.8

Lassa and Mozambique Viruses: Cross Protection in Experiments on Mice and the Effect of Immunosuppressors on Experimental Infection

907C0345A Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 5, Sep-Oct 89 pp 598-603

[Article by N. D. Barkar and I. S. Lukashevich, Belorussian Scientific Research Institute of Epidemiology and Microbiology, BSSR Ministry of Health, Minsk]

[Text] Lassa and Mozambique (Mopeia) viruses are in the Lassa serocomplex that was recently isolated from among viruses of family *Arenaviridae*.[10,11] Besides the indicated viruses, Mobala, Ippy and Skukuza viruses (Lassa-like viruses) were included in the serocomplex. These viruses are included in the same serocomplex on the basis of antigenic kinship and common biochemical characteristics.[7,8,12,16,20,21,24]

Lassa virus circulates in colonies of rodents of genus *Mastomys* in countries of West Africa, and in man it causes hemorrhagic fever of the same name with a high fatality rate.[13] Lassa-like viruses are being isolated from closely related rodents in Central and South Africa, and they apparently do not cause illness in people. Moreover, injection of these viruses into guinea pigs or monkeys protects the animals from subsequent lethal infection by Lassa virus.[10,15,20,25] These data make it possible to view Lassa-like viruses as naturally attenuated variants of Lassa virus suitable for making vaccines.[6,14,20] This approach is also promising owing to two additional circumstances. First of all, it has been established that multiple injection of concentrated inactive Lassa virus preparations into sensitive animals (guinea pigs, strain No 13, macaques) does not elicit development of protective immunity.[20] Second, cellular immunity apparently plays the main role in recovery of experimental animals infected with Lassa virus.[14,20]

In connection with the above, we studied cross protection of Lassa and Mozambique viruses in experiments on mice and the effect of the immunosuppressors cyclophosphamide (CP) and cyclosporin (CS-A) on the outcome of experimental disease elicited by these viruses in mice from a sensitive line.

Materials and Methods

Lassa (Joseah strain) and Mozambique viruses were obtained from Dr G. van der Groen (Institute of Tropical Medicine, Antwerpen). The viruses were accumulated and titrated by the plaque method on Vero cells.[2] The titers of the initial viral preparations were (4-6) x 10^6 PFU/ml.

Mice of the CBA/Lac line weighing 14-16 gm were obtained from the Rappolovo Laboratory Animal Farm of the USSR Acadamy of Medical Sciences. Random-breed mice were obtained from a subsidiary farm of the Belorussian Scientific Research Institute of Experimental Medicine (Zhdanovichi). The animals were infected intracerebrally or intraperitoneally at a dose of 1,000 PFU per mouse. CP (from the Saransk Chemical and Pharmaceutical Plant) and CS-A graciously provided by Prof. J.-F. Borel (Sandoz, Switzerland) were used as the immunosuppressors.

Results

Pathogenicity of Mozambique virus in relation to laboratory mice. It was demonstrated earlier that injection of Lassa virus into the brain of newborn random-breed white mice led to the development of asymptomatic infection in them. On the other hand, intracerebral inoculation of adult mice with the virus elicited development of fatal disease coupled with an LCM-like (lymphocytic choriomeningitis-like) syndrome.[3,4] The pathogenicity of Mozambique virus in relation to random-breed mice and CBA mice was studied in the first series of experiments. Intracerebral injection of Mozambique virus into newborn white mice resulted in the death of more than 40 percent of the animals between days 6 and 10, with typical manifestations of infection. At the same time, young adult mice almost always died with intracerebral inoculation of Mozambique virus. The fatality rate associated with the intraperitoneal method of injection was 64 percent (see table).

Pathogenicity of Mozambique virus in relation to laboratory mice

	Ratio of number dying to total number infected	
Animals	**Intracerebral inoculation**	**Intraperitoneal inoculation**
Random-breed white mice at the age of:		
1-2 days	10/23 (43.5 %)	-
17-21 days	25/26 (96.2%)	16/25 (64.0%)
CBA mice weighing 14-16 gm	20/20 (100.0%)	0/20 (0.0%)

Note: Parentheses indicate percentage mortality.

We demonstrated in previous studies that the pathogenicity of Lassa virus in relation to laboratory mice depends on their genotype.[3,19] For example, all mice of lines C3H/Sn (2-3 weeks) and CBA/Lac died following intracerebral injection of Lassa virus, but BALB/c mice were completely resistant to such infection.[19]

Injection of Mozambique virus into the brains of CBA mice led to the development of an LCM-like syndrome and the death of all animals on days 6-8. At the same time, intraperitoneal injection of Mozambique virus did not elicit the death of CBA mice (see table).

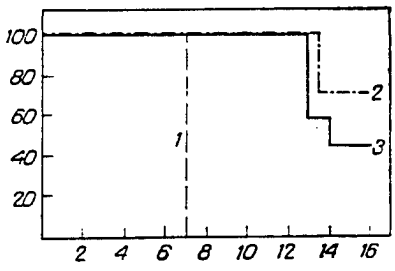

Figure 1. Cross protection of CBA mice with Lassa and Mozambique viruses: Two groups of mice (with seven individuals in each) were infected intraperitoneally with Lassa virus (2) or Mozambique virus (3). Seven days after infection, animals in group 2 received an intracerebral injection of a lethal dose of Mozambique virus, while animals in group 3 received a similar injection of a lethal dose of Lassa virus. Animals of the control group (1) initially received a dose of normal saline solution (intraperitoneally) and were then infected intracerebrally with a lethal dose of virus. Here and in figures 2 and 3, the *y* axis represents the number of surviving mice (in percent), the *x* axis represents days after infection.

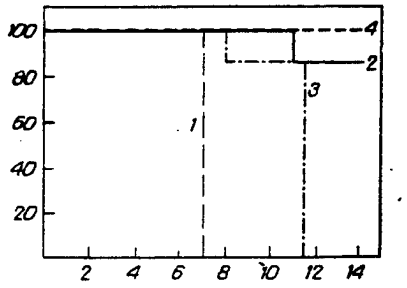

Figure 2. Effect of CP on the outcome of experimental disease in CBA mice infected with Lassa or Mozambique virus: 1—control group of mice infected with virus and not treated with CP; 2—mice infected cerebrally with Lassa virus and treated with CP; 3—mice infected with Mozambique virus and treated with CP; 4—noninfected mice receiving CP in accordance with the experimental procedures

Cross protection of CBA mice with Lassa and Mozambique viruses. We demonstrated in our previous communication that intraperitoneal injection of Lassa virus into CBA mice leads to formation of a population of immunocompetent cells in such mice, producing a protective effect for lethally infected syngeneic recipient mice in experiments on adaptive transfer.[1] In this connection, we subsequently conducted cross-protection experiments on CBA mice in the following way. Groups of mice (with seven individuals in each) were infected intraperitoneally with Lassa or Mozambique virus. Seven days later, a lethal dose of homologous or heterotypic virus was injected into the brain of the animals, and they were kept under observation for 16 days. As we can see from Figure 1, intraperitoneal injection of Lassa or Mozambique virus partially protected the mice from a lethal intracerebral injection of virus for 12 days. Some of the mice died by the end of the observation time. In this case, intraperitoneal injection of Lassa virus protected 70 percent of the mice from intracerebral inoculation of Mozambique virus. At the same time, 45 percent of mice in the group of animals initially infected intraperitoneally with Mozambique virus and then inoculated with a lethal dose of Lassa virus survived (see Figure 1). The results show that CBA mice may be used to study the mechanisms of cross protection between Lassa and Mozambique viruses.

Effect of CP and CS-A on experimental infection of mice with Mozambique and Lassa viruses. Among the mechanisms of homologous and cross protection for Lassa virus and Lassa-like viruses, cellular immune responses—T-lymphocytes, in particular—apparently play the main role.[1,14,18,20,23] In this connection, we concluded our work with a study of the effect of the immunosuppressors CP and CS-A on the outcome of experimental disease elicited in CBA mice by intracerebral inoculation of Lassa and Mozambique viruses. CBA mice were treated with CP, which was injected intraperitoneally at a dose of 40 mg/kg from day 1 through day 4 after intracerebral infection. The result of such treatment was that more than 80 percent of the mice infected cerebrally survived through the observation period (two incubation periods). At the same time, CP treatment did not protect mice infected with Mozambique virus. In this case, all animals died on days 11 or 12 after infection (Figure 2).

Figure 3 illustrates the effect of CS-A on survival of CBA mice infected by means of intraperitoneal injection of Mozambique or Lassa virus. As we demonstrated earlier[1] (see table), such infection did not cause development of acute infection or the death of animals. Injection of CS-A on days 1 and 2 did not affect survival of intraperitoneally infected mice. However, injection of CS-A at a dose of 50 mg/kg intraperitoneally on days 1 through 5 after intraperitoneal injection of the virus resulted in significant mortality among the animals infected with Lassa or Mozambique virus. As is evident from Figure 3, injection of this drug into mice reduced the incubation period. The animals died, beginning on day 3 after infection. In this case, the early death was not associated with the toxicity of CS-A, but was observed both in mice infected with Lassa virus and in mice infected with Mozambique virus. Around 50 percent of the animals died by the end of the incubation period. The number of surviving animals was not more than 40 percent by the end of the period of observation (14 days) (see Figure 3).

Discussion

We studied the pathogenicity of Mozambique virus in relation to random-breed mice and CBA mice: cross

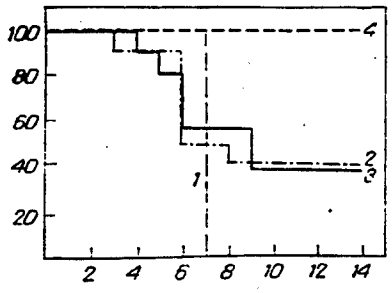

Figure 3. Effect of CS-A on survival of CBA mice infected intraperitoneally with Lassa or Mozambique virus: 1—control group of mice infected with Lassa virus and not treated with the drug; 2—mice infected with Lassa virus and treated with CS-A; 3—mice infected with Mozambique virus and treated with CS-A; 4—non-infected mice receiving CS-A in accordance with the experimental procedures

protection between Lassa and Mozambique viruses was studied in experiments on mice. The effect of immunosuppressors on the outcome of experimental disease elicited by these viruses in CBA mice was also studied.

The research established that newborn random-breed white mice are sensitive to Mozambique virus, but not to Lassa virus, when injected intracerebrally with the infectious material. Similar data were obtained for newborn outbred ICR mice, who were sensitive to Mozambique and Mobala virus, but not to Lassa virus.[9] It may be concluded from these data that the sensitivity of newborn mice to the indicated viruses may serve as a differentiating characteristic between Lassa virus and Lassa-like viruses.

Adult CBA mice were found to be a sensitive biological model not only for Lassa virus injected intracerebrally, but also for Mozambique virus. At the same time, intraperitoneal injection of the indicated viruses into CBA mice led to the appearance of immunocompetent cells that protected syngeneic recipient mice from the effects of intracerebral inoculation of homologous virus. We demonstrated this for Lassa virus[1] and for Mozambique virus (the results are not given here). The study reported here resulted in information on cross protection between these two viruses in CBA mice. These data agree well with the results of cross-protection research carried out on monkeys and guinea pigs (strain No 13).[10,14,15,20,25] The model we used differs advantageously from the last two in terms of its availability to researchers and its economy. Research conducted by Kiley[14] on guinea pigs (strain No 13) and by Cole (cited Johnson[13]) on C57B1/6 mice permits the supposition that cytotoxic effector cells apparently play the main role in cross protection.

Presence of an LCM-like syndrome in mice infected intracerebrally with Lassa virus and the similarity of pathological changes occurring in the brain tissues of mice infected with Lassa and LCM viruses made it possible to hypothesize the presence of an immunopathological mechanism in experimental infection induced by Lassa virus. In fact, as with LCM in mice,[17] immunosuppressive intervention (X-ray irradiation, CP) produced a pronounced therapeutic effect in the case of experimental disease induced by Lassa virus.[1] However, as was shown in our study, treatment of mice with CP following infection with Mozambique virus did not save the mice from development of fatal disease. Thus, the differing effects of CP on the outcome of infection elicited by intracerebral inoculation of Lassa and Mozambique viruses serve as an additional biological criterion by which to differentiate these viruses. We know that CP exerts an influence on various components of the immune response, depending on the dose employed. Small concentrations of CP (up to 100 mg/kg) basically block the function of T-suppressors, while concentrations of up to 200-300 mg/kg produce a cytotoxic and cytostatic effect.[23] Assuming that CP blocks the development of pathological mechanisms that are a function of the activity of certain immunological responses, we can hypothesize that, in the case of Mozambique virus, development of pathological responses is not a function of the population of immunocompetent cells sensitive to CP.

In the case of arenavirus infections, the immune system of the infected organism may play a dual role.[19] On one hand, immunopathological responses may lead to the death of the organism; on the other hand, immune mechanisms are responsible for eliminating the virus from the organism and elicit development of an immune state, which leads to the recovery of the infected animals. The role of the immune system in the recovery of intraperitoneally infected CBA mice was demonstrated by us in experiments with CS-A. It was established that the effect of CS-A manifests itself differently, depending on the system for administering the drug and the means of infection of the animals. Administration of CS-A on day 1 or 2 did not influence the outcome of infection in either intracerebral or intraperitoneal infection. However, administration of CS-A over the course of the first 5 days following intraperitoneal infection led to substantially high mortality among mice infected with Lassa or Mozambique virus. Moreover, a substantial shift was noted, not associated with the CS-A, in the period it took for the infected animals to die. A similar phenomenon was noted by Saron *et al.* with administration of CS-A in mice infected with LCM virus,[22] although, in general, administration of CS-A in mice infected with LCM virus had a favorable influence on the outcome of infection. It was demonstrated in the work reported here that, unlike the data obtained using LCM virus as the model,[22] treatment of animals infected with Lassa and Mozambique virus with CS-A did not have a positive influence on the outcome of disease and, in our case, increased the sensitivity of the animals to these viruses.

It may be hypothesized that, despite the similarity of clinical manifestation of infection elicited in mice by

intracerebral inoculation of LCM, Massa and Mozambique viruses, subclasses of lymphocytes with differing functional activity and sensitivity to immunosuppressors take part in the chain of immunopathological responses leading to a lethal outcome.

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UDC 616.36-002-022:578.891]-022.363-084

Etiology and Prevention of Post-Transfusional Hepatitis in Systematic Screening of Donor Sera

907C0345B Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 5, Sep-Oct 89 pp 621-623

[Article by V. A. Kirilenko and V. A. Ananyev, Vinnitsa Medical Institute imeni N. I. Pirogov, and Virology Institute imeni D. I. Ivanovskiy, USSR Academy of Sciences, Moscow]

[Text] This paper analyzes the extent to which post-transfusional hepatitis (PTH) may be prevented by specific diagnosis of the infection in donors. HBsAg from hepatitis B virus is detected in transfused blood by means of counter-current immunoelectrophoresis (CIEP), a method still in use today. However, the question as to how much this measure has contributed to any decrease in morbidity or any change in the etiology of PTH remains open.

This communication presents the results of systematic testing of donors in a stable urban population. During that time, records were kept on illnesses of recipients, and the etiology of hepatitis suffered by recipients was studied. Completeness of the records was ensured by hospitalizing all patients with clinically expressed hepatitis and by conducting an epidemiological investigation of each case of illness.

Donors were tested at the oblast blood transfusion station beginning in 1976 by means of a standardized CIEP procedure. The same procedure was used to study

blood serum from patients in the oblast epidemiological station's virological laboratory. In addition, blood serum from donors and patients was tested for HBsAg and for antibodies to HBcAg and the delta-antigen (anti-delta) by the laboratory of etiology and pathogenesis of viral hepatitis of the Virology Institute imeni D. I. Ivanovskiy of the USSR Academy of Sciences, which used commercial test kits (the reverse passive hemagglutination test [RPHT] in kits provided by the Gorkiy Institute of Experimental Medicine of the RSFSR Ministry of Health and radioimmunoassay [RIA] in kits provided by the Radioapparat Enterprise and the Nuclear Physics Institute of the Uzbek SSR Academy of Sciences) and experimental test kits (enzyme immunoassay [EIA]).

The results of tests on donor sera at the blood transfusion station are presented in Table 1.

Table 1. Dynamics of identification of HBsAg in donor sera by CIEP (based on data of the Vinnitsa Oblast Blood Transfusion Station)

Year	Quantity of Positive Reactions		%
	Number of Serum Samples Tested	Absolute	
1976	26,300	46	0.174
1977	49,000	90	0.184
1978	51,286	122	0.238
1979	52,000	121	0.232
1980	47,260	125	0.264
1981	42,121	54	0.128
1982	42,296	54	0.128
1983	45,154	25	0.055
1984	46,042	10	0.022
1985	47,300	16	0.033
1986	45,182	7	0.015
Totals	497,941	670	M +/- m equals 0.15 +/- 0.03

As we can see, following a certain amount of growth probably resulting from more comprehensive testing of donors, there began a consistent decline in the number of positive reactions as a result of the elimination of blood donors identified as carriers. The number of carriers identified in 1986 was fewer by a factor of 16 than the maximum number of carriers recorded in 1979. All of this attests to a decrease in the stratum of "CIEP-positive" blood preparations, which permits assessment of the preventive effectiveness of this measure (Table 2).

Table 2. Dynamics of PTH Morbidity

Year	Population	Contracted PTH	Morbidity per 100,000 population	Dynamic series yt
1976	294,000	40	13.6	13.4
1977	304,400	37	12.2	12.7
1978	312,000	32	10.3	12.0
1979	322,000	32	9.9	11.3
1980	323,000	37	11.4	10.6
1981	329,000	37	11.2	9.9
1982	341,000	35	10.3	9.2
1983	343,100	25	7.3	8.5
1984	364,800	23	6.3	7.8
1985	366,800	27	7.4	7.1
Reduction as compared with initial data		by32.2%	by45.6%	by47.1%

Thus, in the 10 years following mass testing of donors, morbidity decreased markedly, which is also confirmed by the results of dynamic series calculations. At the same time, more than half of the PTH cases could not be anticipated, perhaps owing to insufficient sensitivity of CIEP or to some other disease etiology. Additional tests were required to answer these questions. Simultaneous testing of blood sera from the same donors (489) with RPHT identified HBsAg in 1.02 percent of the donors; with CIEP, it did not identify HBsAg in any donors. In a separate series of blood sera from 50 donors, all tests were negative when CIEP was used, the RPHT was positive in two cases (4 percent), and RIA was positive in five (10 percent). Thus, a substantial number of unidentified carriers of hepatitis B virus remain beyond the reeach of CIEP, which enables the continued spread of infection among recipients of blood preparations that are tested by CIEP only.

To confirm this conclusion, we studied the etiology of PTH in conjunction with mass CIEP testing of donors. Individuals who had contracted viral hepatitis after transfusion of blood preparations tested by CIEP were tested for HBsAg by CIEP, RPHT, RIA and EIA; they were also tested for anti-HBc and anti-delta by EIA. Blood for the tests was taken when the patients were admitted for inpatient treatment, i.e., in the early stages of disease. The obtained sera were simultaneously tested

by all of the methods listed above. The results are given in Table 3.

Table 3. Results of testing for HBsAg in PTH patients

Indicator	CIEP	RPHT	RIA	EIA
Total subjects	29	21	23	17
Quantity of positive results:				
absolute	3	14	17	13
%	10.3	66.7	73.9	76.5

The results confirm that hepatitis B virus remains the principal etiological factor of PTH. This conclusion may be illustrated by yet another series of observations accompanying the tests for anti-HBc (Table 4).

Table 4. Results of testing for HBsAg and Anti-HBc in PTH patients

		Test for HBsAg			Test for Anti-HBc
Patient No.	Patient	CIEP	RPHT	RIA	EIA
1.	S. L.	-	-	-	-
2.	N. I.	-	-	+	+
3.	Ye. S.	-	+	+	+
4.	P. G.	-	+	+	+
5.	T. V.	-	-	-	-
6.	T. A.	-	+	+	+
7.	A. Z.	-	+	+	+
Total of positive reactions		0	4	5	5

If, in light of the obtained data, the anti-HBc test is a completely reliable supplement to testing for HBsAg by RPHT and RIA, the CIEP is not.

Presence of anti-delta was detected in three out of 26 tested viral hepatitis patients and 12 persons who fell ill following blood transfusions. It should be noted that presence of anti-delta was also recorded in two samples of donor sera.

Analysis of the obtained data demonstrates that when donor sera are screened by CIEP, fewer than half of the cases of PTH can be prevented. A substantial number of unidentified infection sources remain beyond the scope of this test, and the bulk of the hepatitis cases among recipients continue to be caused by the hepatitis B virus and its association with delta-infection. Testing for HBsAg, for antibodies to the nuclear antigen HBc and for delta-antigen plays a decisive role in the etiological interpretation of those cases.

Thus, in regions with few antigen carriers, the frequency with which HBsAg is identified is many times greater with RPHT than with CIEP, but is less than with RIA and EIA. In order to achieve a higher impact, it would be advisable to include the most sensitive donor testing methods in the complex of preventive measures directed at averting PTH.

UDC 616.98:578.828.6])07:616.157)078.73

Standard Panel of Human Immunodeficiency Virus Positive and Negative Human Sera for Assessment of Sensitivity and Specificity of Diagnostic Enzyme-Linked Assay Kits

*907C0757A Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 2, Mar*Apr 90 (manuscript received 12 May 89) pp 125)128*

[Article by M. S. Vorobyeva, T. D. Shalamberidze, G. V. Fedorova, Z. K. Suvorova, V. V. Pokrovskiy, M. O. Daulina, A. L. Liozner, and Ye. M. Yefremova, State Institute of Standardization and Control imeni L. A. Tarasevich and Central Scientific Research Institute of Epidemiology, USSR Ministry of Health, Moscow]

[Abstract] Five Soviet and foreign diagnostic enzyme-linked assay kits were tested against a panel of 40 human immunodeficiency virus (HIV)-antibody negative and 50 HIV)antibody positive sera. None of the negative sera gave a false-positive result. However, most positive sera gave positive results at higher dilutions than those recommended in the instructions for indirect enzyme-linked assay kits, with one serum giving a false negative result. A higher incidence of false negative results was obtained with direct kits. Finally, all HIV positive sera gave positive results in Western blotting studies. Accordingly, the panel was adopted at nine Soviet research establishments for monitoring the sensitivity and specificity of diagnostic kits for HIV antibodies. Tables 1; references 18: 1 Russian, 17 Western.12172

UDC 616.98-022-078.73

Stability of Major Components of Enzyme-Linked Assay Kits for Human Immunodeficiency Virus Infection Diagnosis

907C0757B Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 2, Mar-Apr 90 (manuscript received 6 Apr 89) pp 128-130

[Article by S. S. Marennikova, E. M. Shelukhina, E. V. Chekunova, G. R. Matsevich, and S. D. Zayko, Scientific Research Institute of Viral Preparations, USSR Academy of Medical Sciences, Moscow]

[Abstract] An analysis was conducted on the stability of two major reagents of enzyme-linked assay systems: human immunodeficiency virus (HIV)-sensitized polystyrene adsorbent and peroxidase-antibody conjugate.

The results demonstrated that stability, sensitivity, and reliability of the assay kits were enhanced by ensuring an adequate concentration of HIV antigen on the adsorbent. In addition, stability of the peroxidase conjugate was found to be predicated on the lyophilization process and readily assessed from the level of activity remaining after heat treatment at 100°C for 1 h. Judicious adjustment of the components for proper concentration and thermal stability was found to be an effective means of extending the shelf-life of these kits to 6 months from the present three-month expiration limits. Figures 1; tables 4.

UDC 615.371:578.821.5].015.4.076.9

Stimulation of Spontaneous and Induced Neoplasms in Mice by Vaccinia Virus

907C0757C Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 2, Mar-Apr 90 (manuscript received 11 May 89) pp 130-132

[Article by N. A. Kharkovskaya, Z. I. Merekalova, and S. A. Khrustalev, Laboratory of Viral Carcinogenesis, Department of Laboratory Animals, All-Union Oncologic Scientific Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] A series of experiments was conducted on BALB/cJLacSto mice to assess the effects of vaccinia virus vaccine on spontaneous and Rauscher virus-induced neoplasms. The results demonstrated that scarification of two-month-old mice with the vaccinia virus led to a statistically significant elevation in the incidence of spontaneous benign and malignant neoplasms, both solid tumors and leukemias. Vaccination before or after intraperitoneal administration of Rauscher virus in a dose of 0.01 or 0.001 ID_{50}/ml resulted in leukemia in 48 and 11.5 percent of the animals, respectively, whereas mice not exposed to the vaccinia virus remained free of the malignancy. The tumor-promoting activity of vaccinia virus was attributed, at least in part, to its immunosuppressive properties and stimulation of cell division. Figures 1; tables 2; references 13: 8 Russian, 5 Western.

UDC 615.371:[578.821.5+579.891].036.8

Clinical Trials With Live Recombinant Smallpox-Hepatitis B Vaccine in Volunteers

907C0757D Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 2, Mar-Apr 90 (manuscript received 6 Mar 89) pp 132-135

[Article by V. I. Chernos, N. V. Chelyapov, T. P. Antonova, L. Ye. Rakhilina, S. S. Unanov, A. D. Altshteyn, L. G. Zakharova, I. I. Fodor, K. A. Bendukidze, F. I. Komarov, B. P. Belyshev, A. V. Dmitriyev, and O. G. Andzhaparidze, Scientific Research Institute of Viral Preparations, USSR Academy of Medical Sciences, Moscow; Institutes of General Genetics, Moscow, and of Biochemistry and Physiology of Microorganisms, Pushchino-on-Oka, USSR Academy of Sciences]

[Abstract] Clinical trials were conducted on male volunteers, 18-20 years old, to assess the safety, reactogenicity, and efficacy of a live recombinant smallpox-hepatitis B (RSHB) vaccine. RSHB vaccine was constructed by inserting the S gene of hepatitis B virus into the LIVP vaccine strain of the smallpox virus. Immunological, clinical, and biochemical monitoring of the subjects showed good tolerance of RSHB with essentially minimal reactogenicity, and antibody production against the smallpox virus, but not against HBsAg. Revaccination with RSHB after 45 days elicited an anamnestic response against the smallpox virus, but not against HBsAg. However, such individuals were primed to respond with much higher antibody titers against HBsAg following vaccination with inactivated plasma hepatitis B vaccine. Figures 1; tables 2; references 8: 2 Russian, 6 Western.

12172

UDC 616.36-002.022.7:578.891]-085.373:578.245]-036.8

Effects of Recombinant Interferon-$_2$ on Interferon Status of Hepatitis B Patients

907C0757E Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 2, Mar-Apr 90 (manuscript received 17 Nov 88) pp 135-138

[Article by V. I. Pokrovskiy, V. V. Malinovskaya, R. T. Murzabayeva, V. I. Vasilyeva, and A. A. Asratyan, Central Scientific Research Institute of Epidemiology, USSR Ministry of Health; Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Abstract] Clinical trials were conducted on 152 patients, 16-65 years old, with acute hepatitis B to assess the benefits of recombinant interferon-α_2. Control data on the interferon status clinical course were derived from acute hepatitis B patients treated conventionally without interferon-α_2, as well as from healthy controls. Interferon-α_2 was administered intravenously and intramuscularly in doses of 10^6 IU for 5 to 10 days. Control data from the healthy cohort showed virtual absence of plasma interferon, while induction studies with leukocytes yielded approximately 403 IU/ml of interferon, and with lymphocytes approximately 137 IU of interferon-γ/ml. Patients with acute hepatitis B, prior to treatment, displayed elevated serum levels of interferon (6.7 IU/ml) combined with depression of leukocytic production of interferon-α and -γ to 9-9.7 percent of the control level. Treatment with recombinant interferon-α_2 had a beneficial effect on the clinical course of interferon production, accelerating more complete recovery and precluding progression to chronic hepatitis. Best results were seen in acute hepatitis B patients treated early in the disease with interferon-α_2, who also presented with a marked improvement in their interferon status. The

study also demonstrated that monitoring the interferon status of patients with acute hepatitis B provides meaningful prognostic criteria. Figures 3; references 13: 8 Russian, 5 Western.

UDC 615.281:578.245.2].076.9

Antiviral Efficacy of Amyxin and Its Effects on Interferon Status in Mouse Hepatitis

907C0757F Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 2, Mar-Apr 90 (manuscript received 23 May 89) pp 138-140

[Article by S. S. Grigoryan, A. M. Ivanova, and F. I. Yershov, Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Abstract] Mouse trials were conducted on Amyxin, a low molecular weight Soviet interferon inducer, via infection with mouse hepatitis virus. Amyxin, 2,7-bis[2-(diethylaminoethoxy)-9-OH dihydrochloride, was administered orally in a dose of 4 mg/mouse to 16-18 g mice 1 to 7 days before the animals were infected orally with 0.2-0.3 ml of a 30-40 percent suspension of the mouse hepatitis virus. Amyxin was found to induce a rapid rise in serum interferon, reaching a maximum of 1280 U/ml in 24 h (20-80 U/ml in 48-72 h), with reduction of the mortality rate to 40-50 percent if infection followed in 24-72 h, versus a control mortality rate of 100 percent. However, infection after 72 h reduced the survival rate to 10-20 percent, and after 7 days the mortality rate was 100 percent. Concomitant evaluation of the interferon status showed that amyxin led to a 8- to 10-fold increase in interferon-α and -γ production by splenic lymphocytes over control levels. In untreated mice, infection resulted in depression of interferon-α and -γ synthesis. These observations demonstrated that prophylactic administration of amyxin was effective in reducing mortality due to mouse hepatitis virus and in improving the interferon status of animals. Accordingly, the data indicate that amyxin should be considered for prevention of human hepatitis A. Figures 2; tables 2; references 7: 4 Russian, 3 Western.

UDC 578.833.26:578.23].08

Lysosomotropic Agents Inhibiting Arenavirus Infection of BHK-21 and Vero Cells

907C0757G Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 2, Mar-Apr 90 (manuscript received 7 Feb 89) pp 146-150

[Article by S. Ye. Glushakova, A. I. Yakuba, A. D. Vasyuchkov, R. F. Maryankova, T. M. Kukareko, T. A. Stelmakh, T. P. Kurash, and I. S. Lukashevich, Belorussian Scientific Research Institute of Epidemiology and Microbiology, Belorussian SSR Ministry of Health, Minsk]

[Abstract] A series of agents acting on lysosomes was evaluated for their effects on adsorption and ingress of arenaviruses into cells in order to determine whether a pH-dependent mechanism was involved in the initiation of infection. The study relied on BHK-21 and Vero continuous cell cultures pretreated with ammonium chloride, monensin, amantadine, or chloroquine for 1 h prior to exposure to Lassa, Mozambique, or Pichinde AN 3839 arenaviruses. The results showed that pretreatment of the cells with agents that effect an increase in the pH of cell organelles from approximately 4.8 to 5.0-6.0 leads to virtually complete inhibition of arenavirus replication. The study also revealed that Mozambique virus was 30-40 times as susceptible to the effects of these agents as the Pichinde and Lassa viruses, an interesting difference in view of the serologic relatedness of the Lassa and Mozambique viruses. In addition, complete inhibition of Mozambique virus replication was obtained even on simultaneous addition of the virus and ammonium chloride to the cultures. Finally, the earliest stages of virus-cell interaction, i.e., adhesion, were observed to most susceptible to the action of the agents in question. Figures 6; tables 1; references 16: 2 Russian, 14 Western.

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